RUBBER WORLD

JANUARY, 1956

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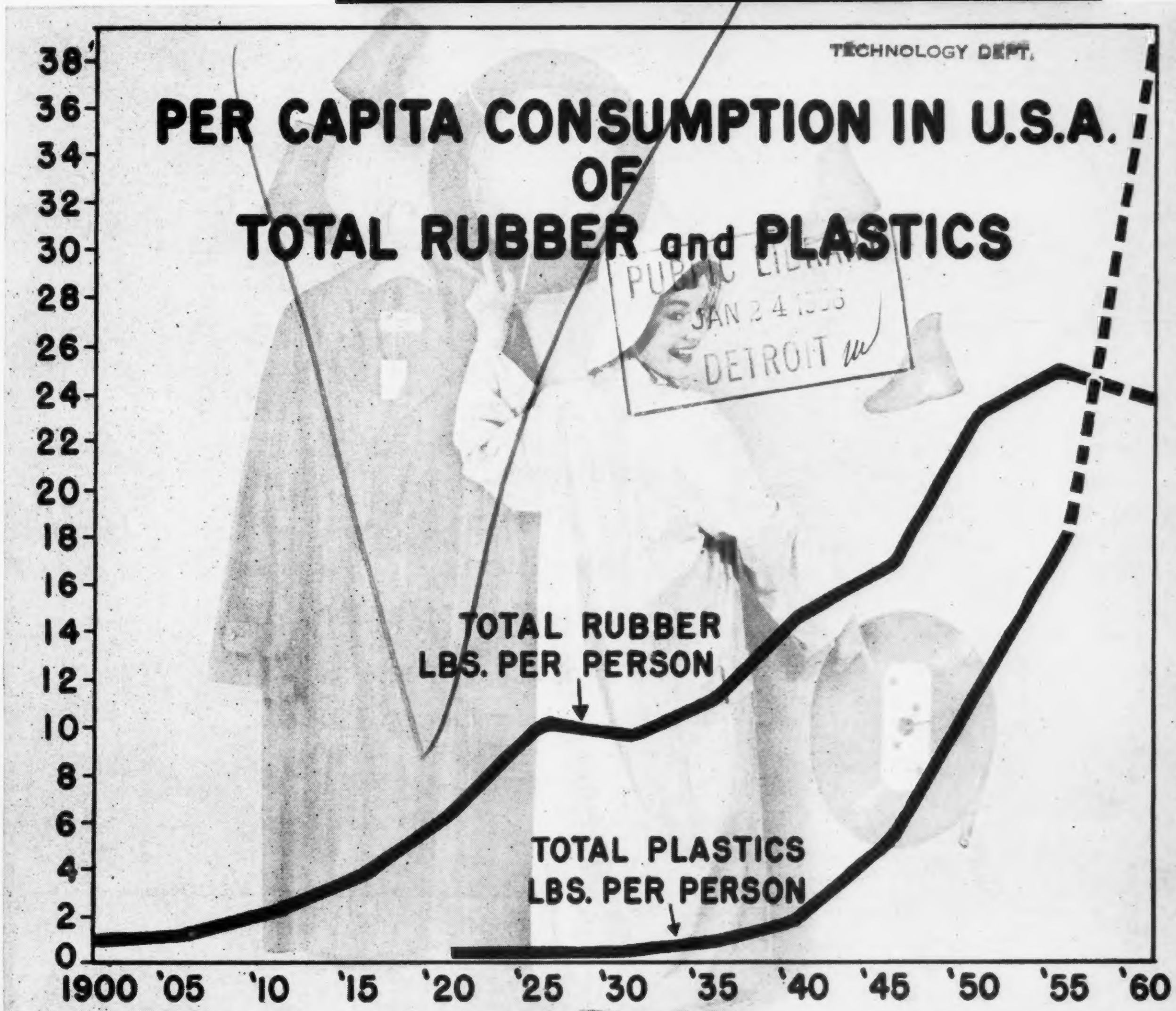

A NEW ERA IN SYNTHETICS IN RUBBER TO MATCH PLASTICS?

By George R. Vila, page 519

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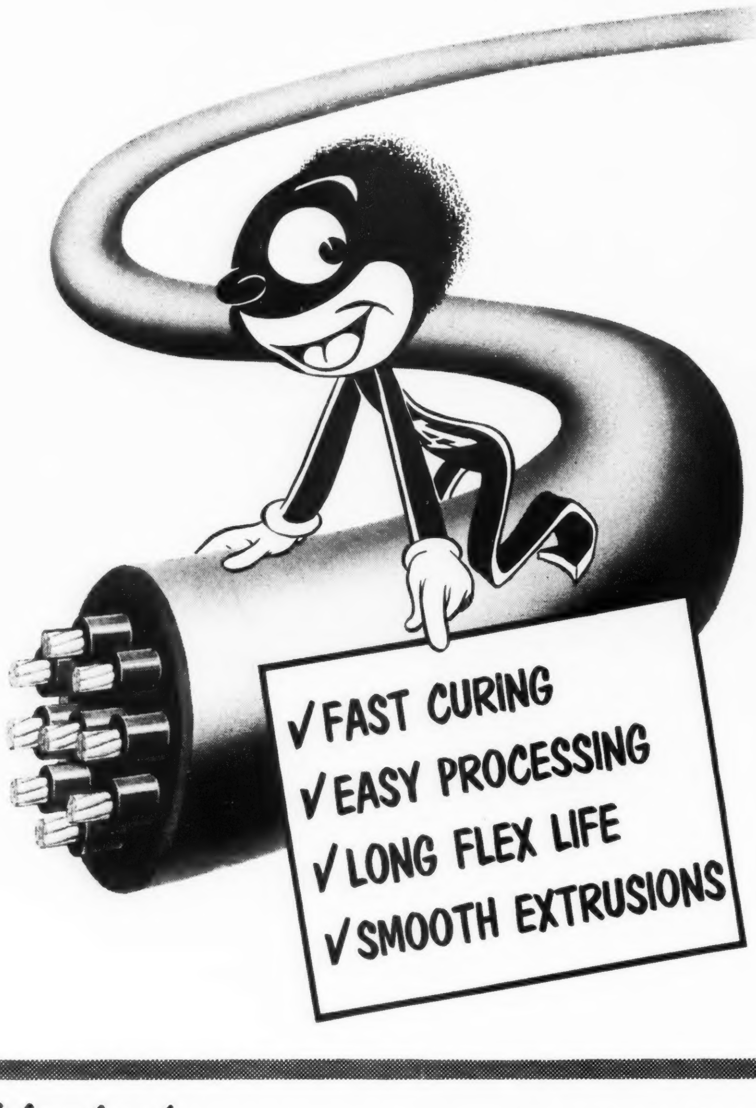

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Now—it's "Wall-

The fast-growing trend from wallpaper to "wall-plastic" holds much promise as a great, new field of application for vinyl resins.

Pictured at right is one of the early steps in the manufacture of *Cohyde* – a premium-quality, plastic coated fabric especially designed for use as a commercial, institutional and industrial wall covering.

This heavy-duty covering is made with a plastisol based on PLIOVIC AO–a vinyl copolymer resin. It is outstanding in its three-dimensional beauty and durability. It is designed to make the most of a momentum-gathering market.

PLIOVIC AO was selected for this application because it can be processed at relatively low temperatures. This not only makes for easier, more closely controlled production, but results in a more uniform product of better physical properties, by virtue of a shorter heat history being acquired.

Plastisols are economically compounded and processed with PLIOVIC AO, because it is an internally plasticized copolymer. This means its fine particles are more easily solvated than those of other resins, permitting use of a wider range of lower cost plasticizers and minimizing grinding. It also means the dispersion can be fused at as low as 280° F. for greater latitude in equipment and fabrics used.

If you plan on entering the "wall-plastic" field or on manufacturing any vinyl coated fabric, you'll find it to your advantage–processing- and product-wise–to know more about PLIOVIC AO. For details and the latest Tech Book Bulletin, write to:

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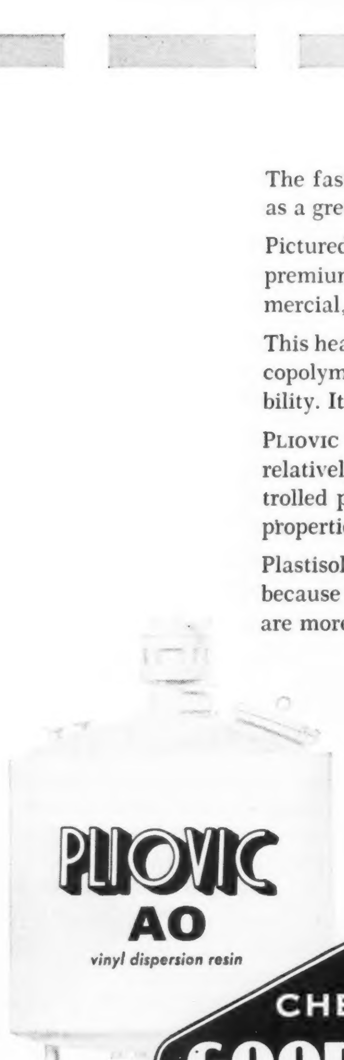

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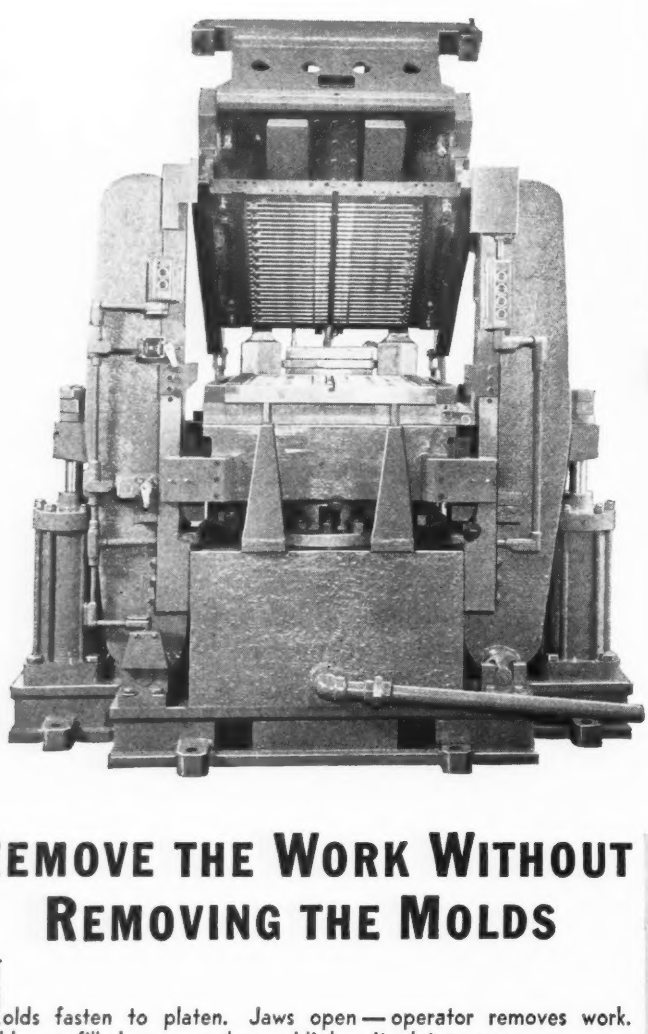
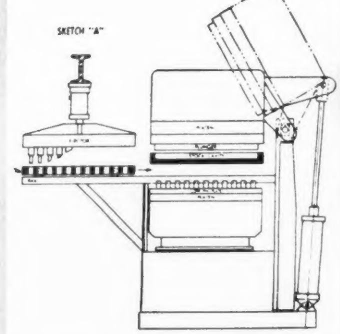


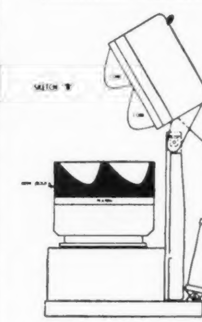


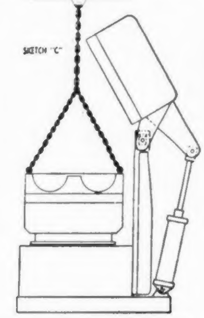
VERSATILITY

In this transfer moldi
operation, mold retra
from press for ejecti
of parts, such as ve
cally molded bushin

COMPRESSION MOLDING

Although deep molds must remain in press, ample working space is provided with minimum working stroke.





MOLD SET-UP

Heavy molds can
set up in press w
overhead hoist . . .
ing time and "hors
of expensive molds.

REMOVE THE WORK WITHOUT REMOVING THE MOLDS

Molds fasten to platen. Jaws open — operator removes work. Molds are filled — press closes. High unit platen pressure.

Easy accessibility to all parts of mold and stock cavity, in combination with short ram stroke to minimize overall working cycle.

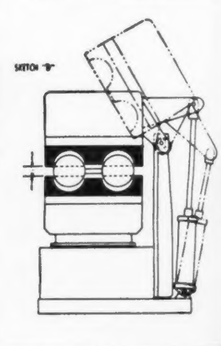
Useful for deep or shallow molding. Can be equipped for Transfer Molding. Operates off Centralized Hydraulic System or individual pumps. No heavy lifting or straining. No chance for off register of molds.

Hydraulic operation has the advantage of giving full pressure at any position of the ram during its working stroke.

Note: A movie film showing complete cycle operation available in 16 mm.

SHORT STROKE

Actual power stroke of main ram is held to the minimum. 95% of working space (day light) is accomplished by quick acting tilting head. Only 3½" of ram travel required to actuate press.



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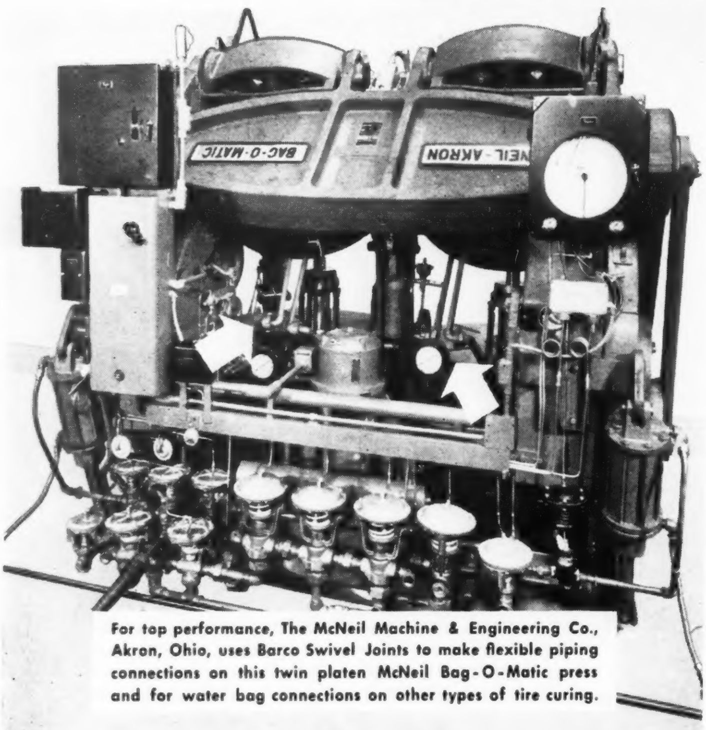
SELF-ALIGNING **BARCO** SWIVEL JOINTS



For top performance, The McNeil Machine & Engineering Co., Akron, Ohio, uses Barco Swivel Joints to make flexible piping connections on this twin platen McNeil Bag-O-Matic press and for water bag connections on other types of tire curing.

Read What Users Say:

- "Joints last 3 or 4 times longer than other methods of providing flexibility—with no maintenance required."
- "With Barco Joints and the new 11CTS gaskets we handle alternating steam and cold water without leakage."
- "Barco Joints on our platen presses *don't get in the way* like non-rigid lines. They permit *accurate temperature control too.*"
- "We're interested in *safety and avoiding shut downs.* Your joints *don't break or fail suddenly.*"
- "Your self-alignment feature makes *installation easy.*"
- "We like your joints because they require so little maintenance. We don't even have to lubricate them."

How Improved Barco Swivel Joints Make Tire Molds, Presses Work Better

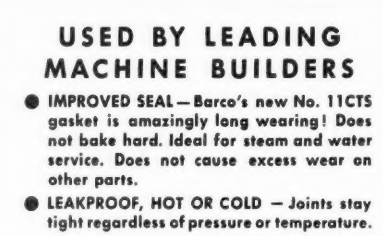
DEPENDABLE, TROUBLE-FREE PERFORMANCE—time after time—has been the one big reason for using Barco Swivel Joints in flexible piping connections and dog-legs on tire molds and platen presses used in the rubber industry. And now Barco offers even *better* performance and service, not only for new uses, but for thousands of existing installations.

The ANSWER is Barco's new, chemically inert No. 11 CTS gasket. No other material is as amazingly long wearing and versatile. Even under most adverse conditions, joints maintain their seal, hot or cold, working or idle—with lower torque and no lubrication required. Natural operating action keeps the hemispherical ball of the joint lapped to a perfect fit.

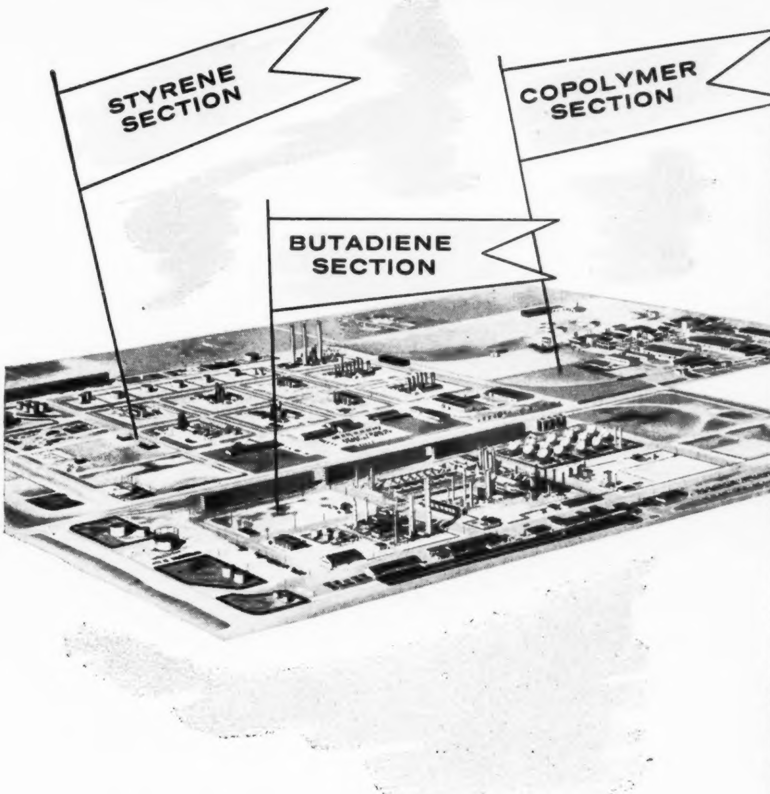
Get this advanced performance in new Barco Swivel Joints! Send for complete information on MODERNIZING old joints!

USED BY LEADING MACHINE BUILDERS

- **IMPROVED SEAL**—Barco's new No. 11CTS gasket is amazingly long wearing! Does not bake hard. Ideal for steam and water service. Does not cause excess wear on other parts.
- **LEAKPROOF, HOT OR COLD** — Joints stay tight regardless of pressure or temperature.
- **SELF-ALIGNING** — 10° side flexibility. This Barco feature saves piping time, cuts costs, and insures perfect performance.
- **ENGINEERING RECOMMENDATIONS**—Send for a copy of Catalog No. 265A and installation drawing 10-52004.



BARCO MANUFACTURING CO. BARCO 510B Hough Street, Barrington, Illinois

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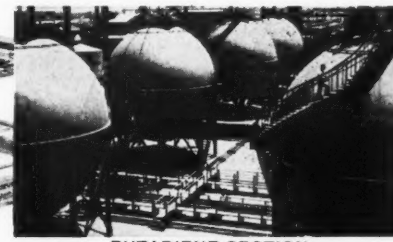
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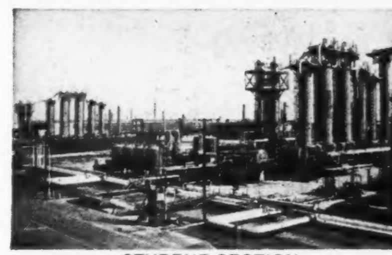
STYRENE SECTION

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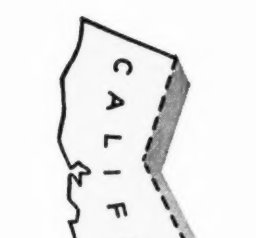

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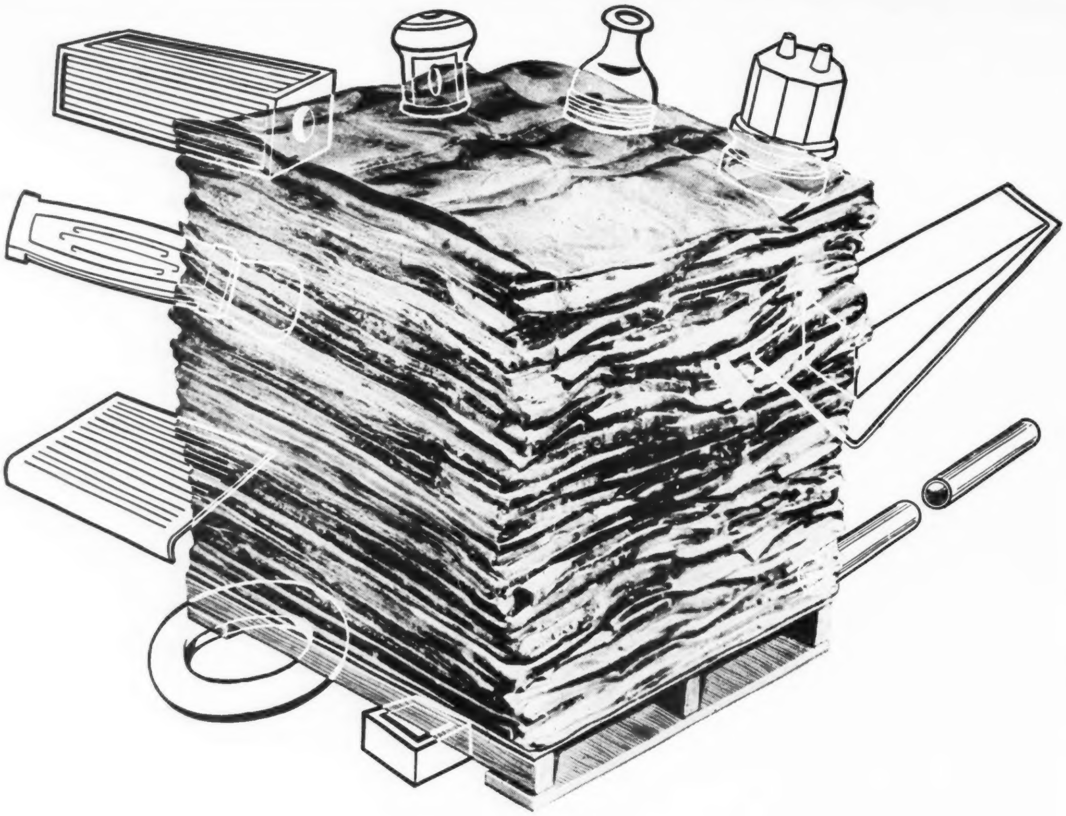

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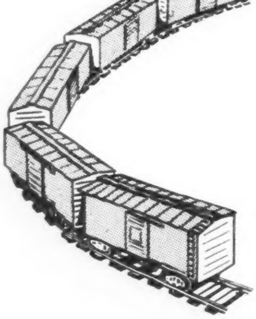
you can use part of this shipment!



Every day five carloads of Pequanoc's quality reclaimed rubber come off the production line to become a part of many industrial and consumer rubber products whose formulas use Pequanoc reclaim to advantage.

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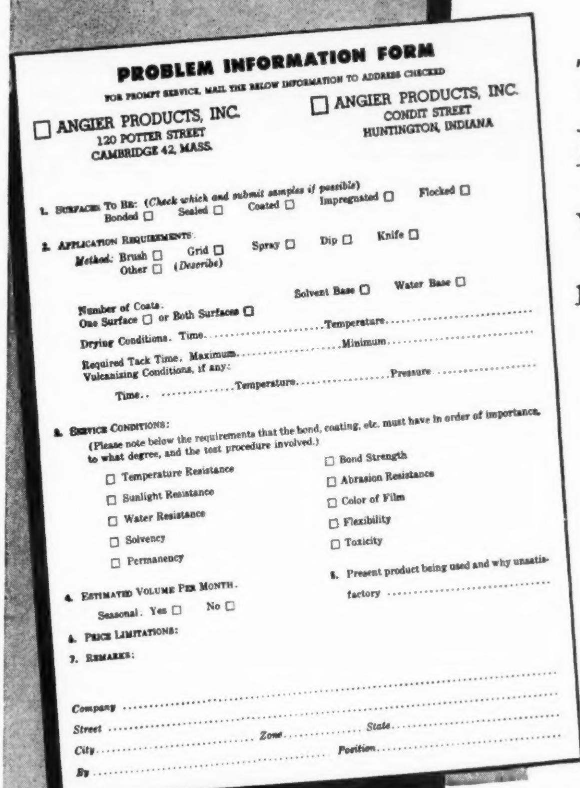

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120 POTTER STREET
CAMBRIDGE 42, MASS.

☐ ANGIER PRODUCTS, INC.
CONDIT STREET
HUNTINGTON, INDIANA

1. SURFACES TO BE: (*Check which and submit samples if possible*)
   Bonded ☐ Sealed ☐ Coated ☐ Impregnated ☐ Flocked ☐
2. APPLICATION REQUIREMENTS:
   Method: Brush ☐ Grid ☐ Spray ☐ Dip ☐ Knife ☐
   Other ☐ (*Describe*)
   Solvent Base ☐ Water Base ☐
   Number of Coats.
   One Surface ☐ or Both Surfaces ☐
   Drying Conditions. Time.................Temperature.................
   Required Tack Time. Maximum.................Minimum.................
   Vulcanizing Conditions, if any:
   Time.. ....Temperature.................Pressure.................
3. SERVICE CONDITIONS:
   (Please note below the requirements that the bond, coating, etc. must have in order of importance, to what degree, and the test procedure involved.)
   ☐ Temperature Resistance
   ☐ Sunlight Resistance
   ☐ Water Resistance
   ☐ Solvency
   ☐ Permanency
   ☐ Bond Strength
   ☐ Abrasion Resistance
   ☐ Color of Film
   ☐ Flexibility
   ☐ Toxicity
4. ESTIMATED VOLUME PER MONTH.
   Seasonal. Yes ☐ No ☐
5. Present product being used and why unsatisfactory ....
6. PRICE LIMITATIONS:
7. REMARKS:

Company ....
Street .... *Zone*................. *State*.................
City................. *Position*.................
By ....

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How high load capacity is built into less space in Dodge-TIMKEN All-Steel pillow block

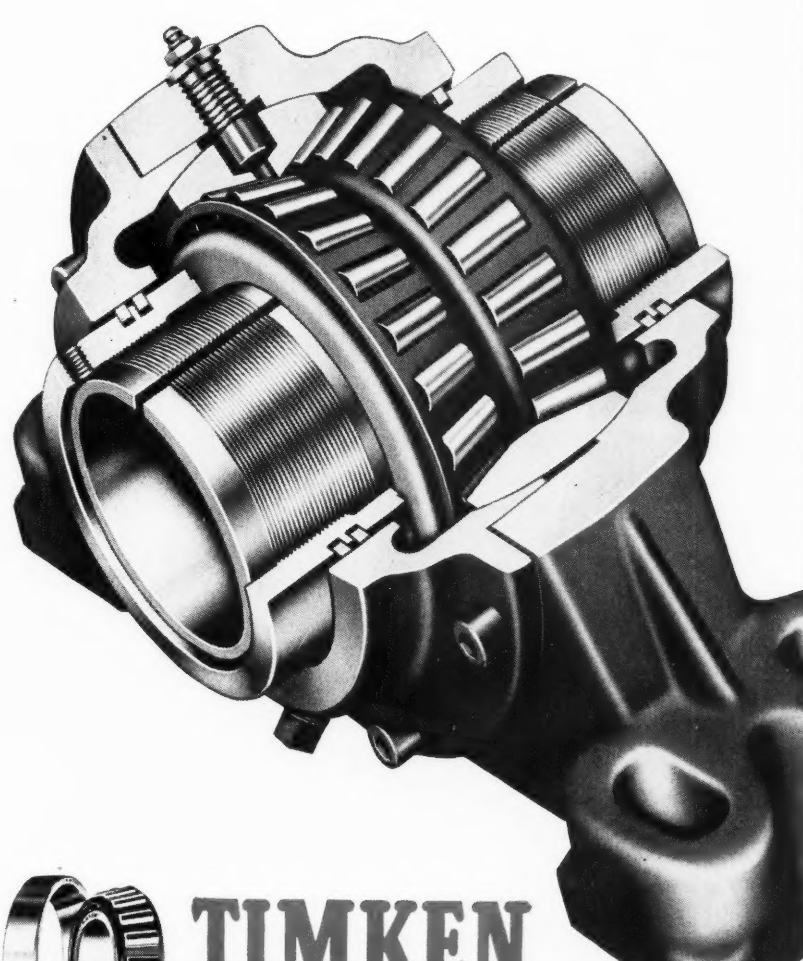
THIS rugged Dodge-Timken pillow block packs more capacity in less space than ever before. All-steel construction gives it extra strength and durability. The design is compact. No special thrust devices that take up extra space are needed—the two-row Timken® tapered roller bearing takes *both* radial and thrust loads in any combination. And full line contact between the rollers and races assures high load capacity.

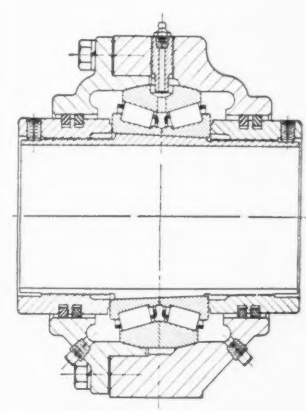
The cutaway view below shows the bearing. It is of special design, with tapered bore and self-aligning spherical outer surface—never requires adjustment. As in all Timken bearings, races and rollers are case-carburized and have tough, shock-resistant cores under hard, wear-resistant surfaces. Under normal conditions, the Timken bearing will last the life of the machinery with which the pillow block is used.

In addition to the all-steel pillow block shown here, Timken bearings are also used in the Type "E", Double-Interlock, Type "C", and Special-Duty pillow blocks—other versatile pillow blocks in the Dodge-Timken line with a wide variety of uses in industry.

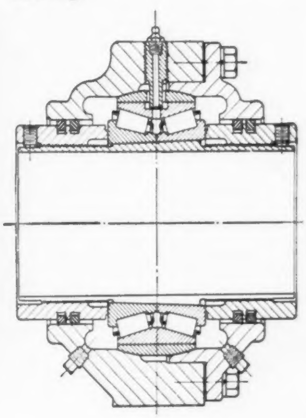
To be sure of the finest bearing steel, we make our own—America's only bearing manufacturer that does. No other bearings can give you all the advantages you get with Timken bearings. Include them in your design plans... specify them for the machines you buy or build. Look for the trademark "Timken"—it's on the bearing that makes any machine run better. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

This symbol on a product means its bearings are the best.





How **DODGE MANUFACTURING CORPORATION,** Mishawaka, Ind., mounts Timken bearings in the Dodge-Timken All-Steel pillow block. Above: non-expansion block with fixed bearing. Below: expansion block with floating bearing.



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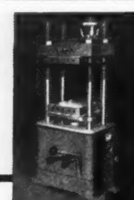

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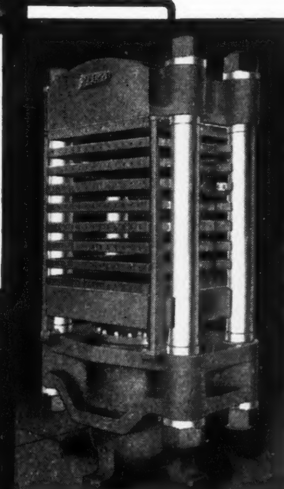

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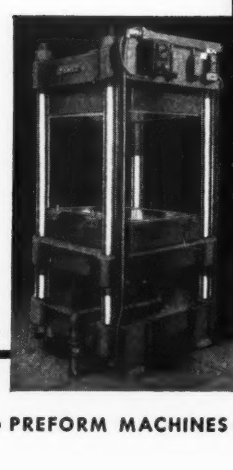

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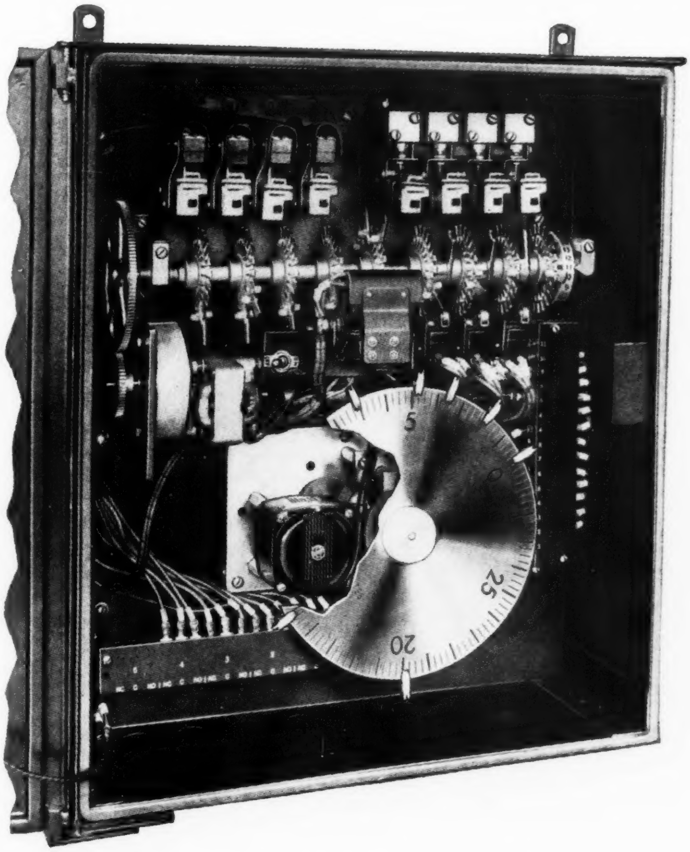

with the new Taylor

FLEX-O-TIMER*

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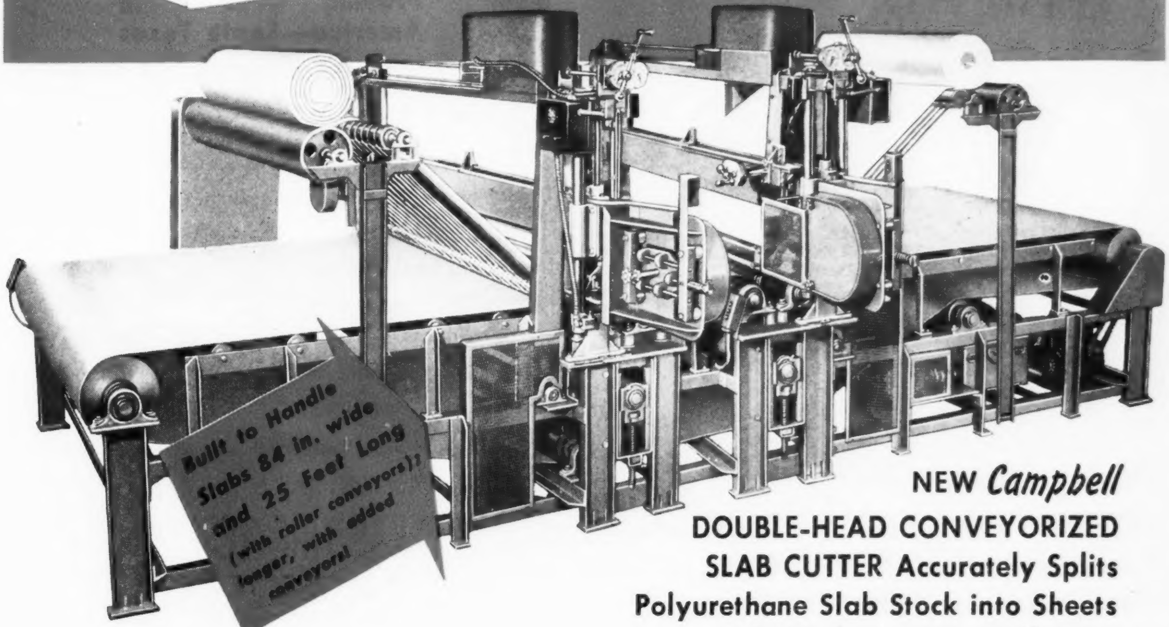

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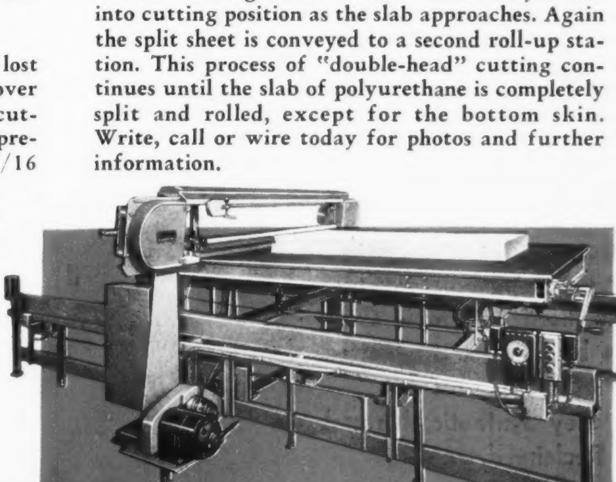

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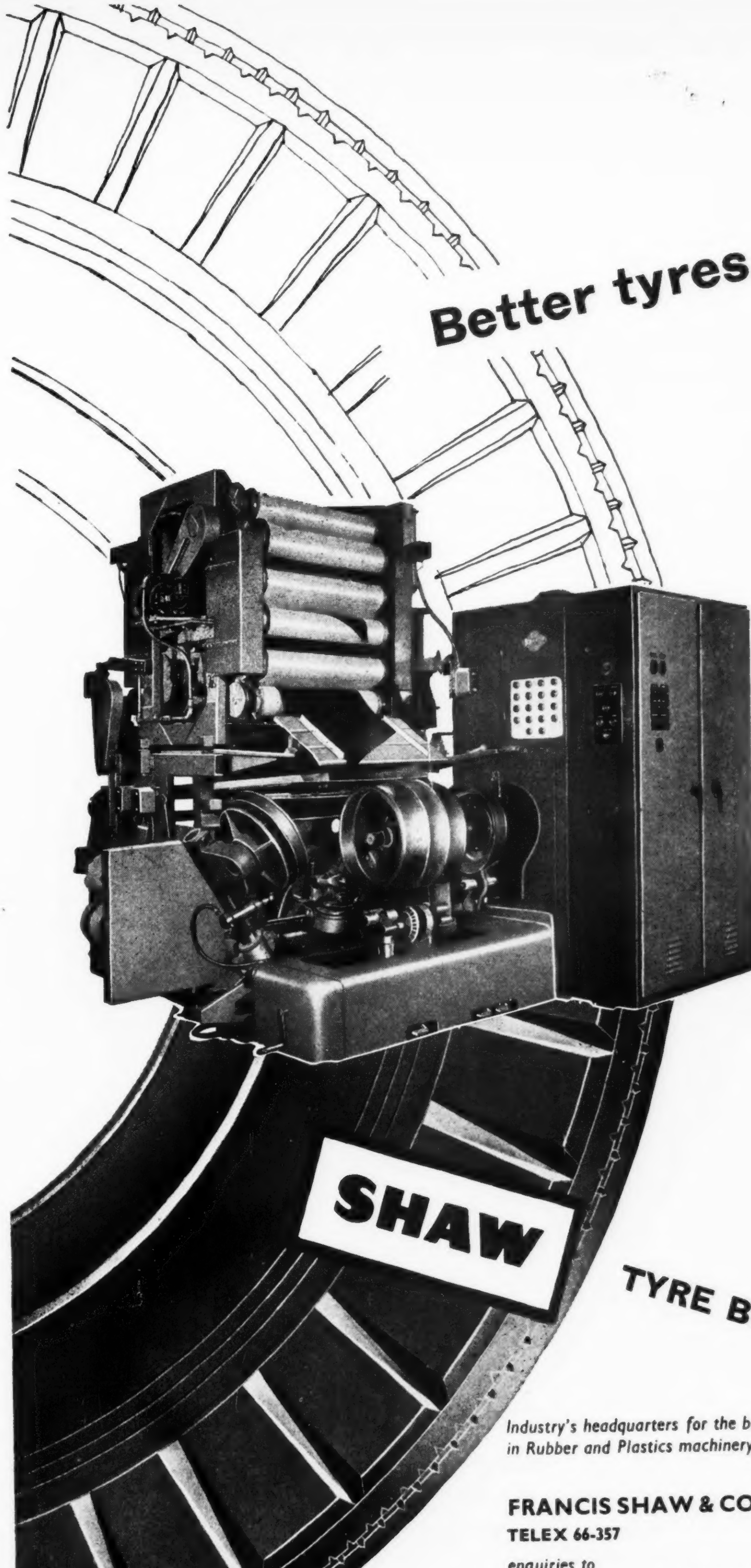

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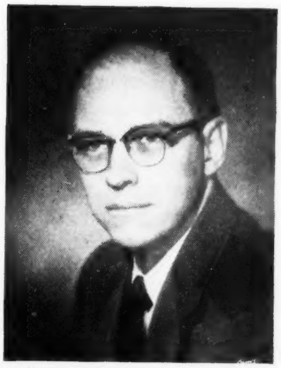


Madison Geddes

C. H. Lufter

Peroxide Cures of Nitrile Rubber[1]

By C. H. LUFTER
B. F. Goodrich Chemical Co., Avon Lake, O.

Several organic hydroperoxides have been found to produce nitrile rubber vulcanizates with excellent physical properties, but the scorch characteristics of the compounds have been a major problem. Dicumyl peroxide has produced nitrile rubber vulcanizates with the desirable physical properties obtained with hydroperoxides along with acceptable scorch characteristics. DCP cured compounds possess the attributes of heat-resistant sulfur-cured compounds as well as resistance to blooming and tarnishing and with improvements in low-temperature brittleness and compression set.

MANY attempts to produce vulcanizates using peroxidic chemicals have been recorded in the literature since Ostromislensky (1)[2] published his classic series dealing with the vulcanization of rubber using peroxides, peracids, oxygen, and ozone. In 1928, Fisher and Gray (2) reported vulcanization of pale crepe with benzoyl peroxide and concluded there was no change in unsaturation produced during the process. Blake and Bruce (3) in 1937 presented data to prove a decrease of unsaturation during vulcanization with nitro compounds and benzoyl peroxide. They concluded that during vulcanization with benzoyl peroxide the peroxide or products from it add chemically to the double bond. Tensile strengths of 1,000 to 2,000 psi. were reported.

Meanwhile Whitby (4) had postulated that the vulcanization of rubber involves polymerization and had drawn an analogy between a rubber cure with benzoyl peroxide and the polymerization of vinyl acetate. Dufraisse and LeBras (5) summarized the literature available concerning peroxide curing of rubber by noting that all such vulcanizates to that time had poor aging properties; however, they felt that with the proper ingredients to lower the rate of rubber oxidation, vulcanization by the use of oxidants would be feasible. Maximum tensiles of approximately 1,500 psi. were reported.

Vulcanization Mechanism

Farmer and Michael (6) as well as Hermans and Van Eyk (7) studied the mechanism involved in peroxidic vulcanization by investigating the reactions of cyclohexene with benzoyl peroxide. The former reported in 1942 that the olefin molecules are attached by the free radicals principally at the alpha methylene groups, but with some evidence of attack at the double bonds. From their analytical data and observations these men concluded that free radicals from the peroxide, as it decomposes, initiate the cross-linking, which can then be continued through a chain reaction mechanism.

Alfrey, Hendricks, Hershey, and Mark (8) presented a detailed description of the action of peroxide vulcanization which appears to summarize the latest thinking on this type of vulcanization. They proposed that the initial step is the removal of one alpha methylenic hydrogen atom. The rubber free radical thus formed attacks an adjacent chain by reacting with a double bond, producing a carbon to carbon cross-link and a new free radical. The cross-linking reaction may then continue adding more chains to those already linked together. Transfer of the free radical to another polymer

[1] Presented before the Division of Rubber Chemistry, ACS, Detroit, Mich., May 6, 1955.
[2] Numbers in parentheses refer to Bibliography items at end of this article.

chain may occur, starting another growing chain without the loss of the polymer free radical. Termination of the cross-linking reaction occurs through the reaction of two free radicals.

Based on the literature cited, which has been concerned with natural rubber, Figure 1 represents a simplified sketch of the possible reactions of a free radical (R•), resulting from decomposition of the peroxidic material, with a portion, of the butadiene-acrylonitrile copolymer. The first reaction is considered to represent the bulk of the reaction.

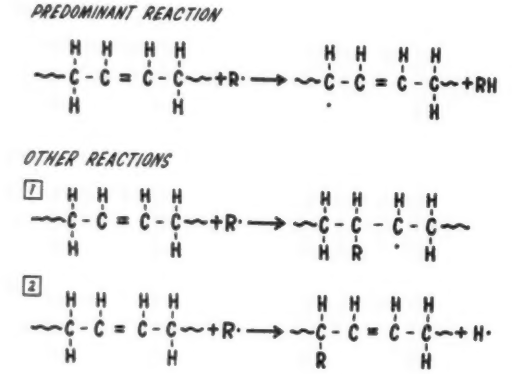


Fig. 1. Possible reactions involved in free radical attack on the polymer

Figure 2 presents the cross-linking reaction which it is felt results during vulcanization of the polymer. It is evident that after one cross-link is formed, as shown, further carbon to carbon links may be formed by the same mechanism.

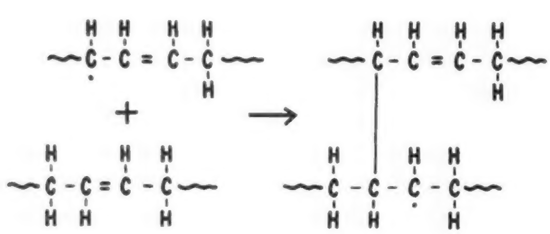


Fig. 2. Mechanism of cross-linking reaction

As shown in Figure 3, the free radical is destroyed by reaction with another free radical with which it comes in contact. This may be in the form of another polymer chain or the free radical which results from the peroxidic chemical used to promote the vulcanization. It should be noted that other non-radical constituents, such as those capable of resonance, may remove the effectiveness of the free radical by virtue of their energy-absorbing characteristics.

In addition to the literature already cited, other investigators (9-11) have reported recently on the cure mechanism and the physical properties obtained through the vulcanization of rubber with peroxides. In all but one case the only polymer investigated was natural rubber. The best tensile strength reported for natural rubber varied from 730 psi. when benzoyl peroxide was used up to 2,600 psi. when di-tertiary butyl peroxide was used, and 1,850 psi. when tert. butyl perbenzoate was used. The reference containing data showing stress-strain properties of synthetic polymers (9) recorded the maximum tensile strength of black reinforced Buna S rubber at 110 psi. and a black reinforced nitrile rubber at 1,600 psi. when benzoyl peroxide was used as the vulcanizing agent.

It is evident that the peroxide cure has been valuable in isolating a new cure system for polymers, and a study of the peroxide cure mechanism may even have guided some of the latest theories of the mechanism of sulfur vulcanization. Vulcanizates resulting from peroxide cures, however, have generally been impractical for one or perhaps several reasons, and application to the olefinic synthetic polymer is almost completely neglected in the literature. Interest in the vulcanization of nitrile polymers using a peroxidic system has lead to the development of practical compounds with interesting and useful properties.

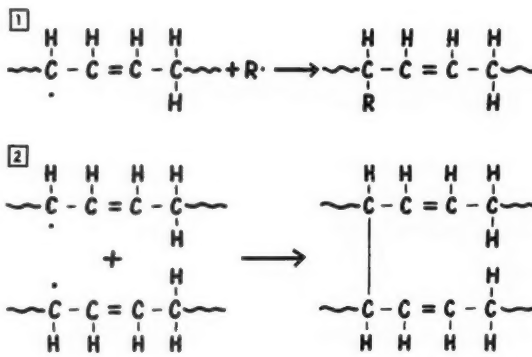


Fig. 3. Some termination reactions

Hydroperoxides in Nitrile Rubber

The earliest work with peroxide-type cures of nitrile rubber used t-butyl hydroperoxide as the vulcanizing agent. It was soon evident that the volatility of this chemical was much more than could be tolerated for good milling operations. During the process of testing other less volatile oxidants it was found that potassium permanganate, ammonium persulfate, sodium perborate, and benzoyl peroxide were of little value in curing nitrile rubber; while several hydroperoxides showed definite promise in nitrile rubber formulations. Table 1 shows the basic properties obtained with a number of hydroperoxides. The higher molecular weight hydroperoxides gave promise of being equal to t-butyl hydroperoxide in the properties produced, but with virtually no loss of curative during milling.

Table 2 compares three types of hydroperoxide in another medium acrylonitrile content polymer with a tetramethylthiuram disulfide (TMTD) cured control. The striking features of the hydroperoxide vulcanizates are the fast 250° F. scorch, the lower tensile and elongations compared with those of the TMTD control, and the excellent low-temperature brittleness. The retention of properties during accelerated aging of the hydroperoxide cured stocks was good. The inclusion of dioctyl

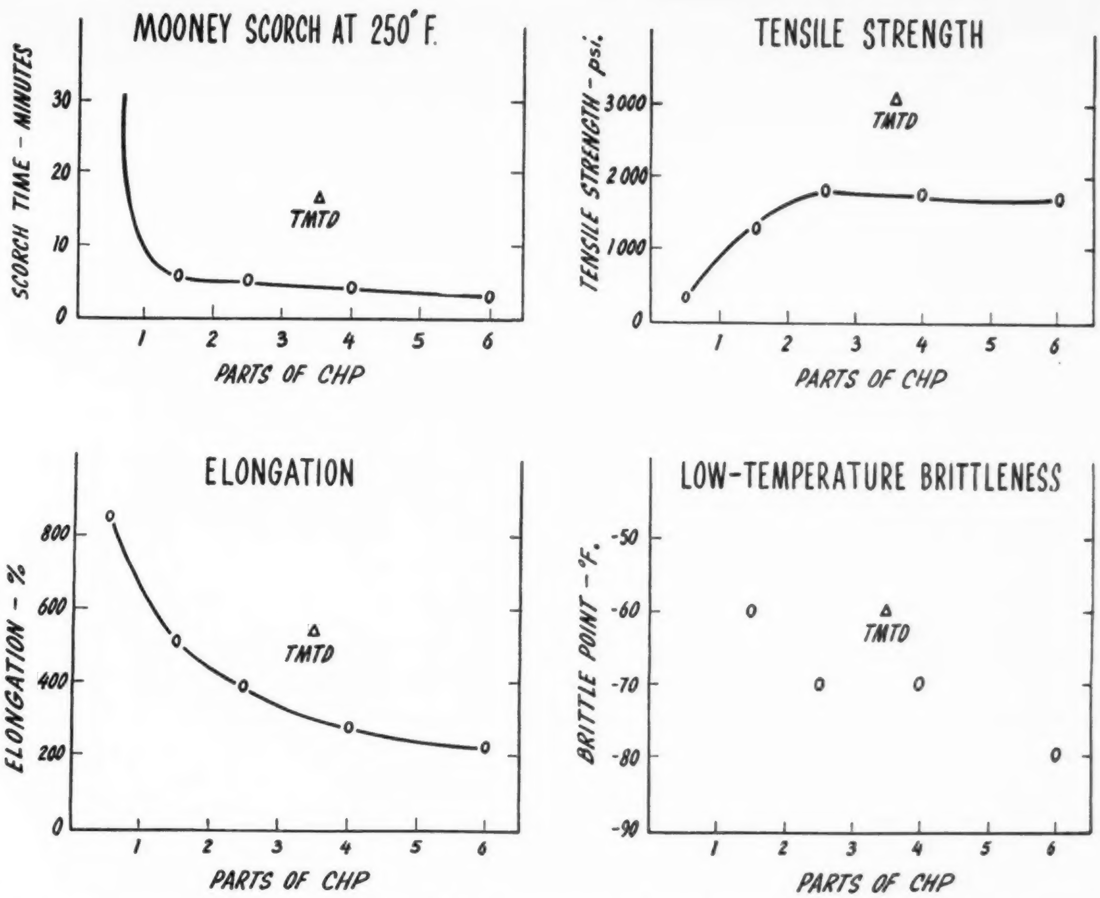


Fig. 4. Vulcanizate properties of medium high nitrile content rubber (Hycar 1042) cured with varying amounts of cumene hydroperoxide, compared with tetramethylthiuram disulfide vulcanizate properties

adipate in one of the compounds reduced the tensile properties with no observable improvement in low-temperature brittleness.

Cumene Hydroperoxide Levels

Cumene hydroperoxide (CHP) was selected on the basis of availability and preliminary results as the oxidant to concentrate on in future cure studies. With this thought in mind the CHP level was varied from 0.5 to 6.0 parts in a simple nitrile rubber recipe.

In addition to establishing the optimum level of the CHP (72% purity) at 2.5 parts per 100 of rubber, the data shown in Figure 4 demonstrated again the lower tensile and elongation when results were compared with those for a conventional sulfur vulcanizate. Some advantage in low-temperature brittleness is again evident for the CHP cures.

The scorch tendency of CHP was confirmed by shelf

TABLE 1. HYDROPEROXIDE LEVELS IN CURING NITRILE RUBBER

Hycar 1012[1] (medium high nitrile rubber)	100.0	100.0	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0	5.0	5.0
FEF carbon black[2]	40.0	40.0	40.0	40.0	40.0
Stearic acid	1.0	1.0	1.0	1.0	1.0
Curatives					
t-BHP[3]	5.0	—	—	—	—
DIP[4]	—	5.0	—	—	—
PMH[5]	—	—	5.6	—	—
CHP[6]	—	—	—	2.5	—
TMTD[7]	—	—	—	—	3.5
Curative loss on milling, %	60.0	7.0	6.0	0.0	5.0
Remaining after milling, parts	2.0	4.7	5.3	2.5	3.3
Physical properties—310° F. cures					
Tensile strength, psi., 30 min.	2400	2050	2450	2200	2750
Modulus, psi., 300%, 30 min.	—	—	2100	2050	1750
Elongation, %, 30 min.	270	335	360	320	430
Compression set, %,[8] 45 min.					
70 hrs. @ 212° F.	17	24	19	22	22
250 F.	31	33	25	30	35
Shore A durometer hardness, 45 min.	73	71	69	72	69

1 B. F. Goodrich Chemical Co., Cleveland, O.
2 Philblack A. Phillips Chemical Co., Akron, O.
3 Tertiary butyl hydroperoxide (60% active). Wallace & Tiernan, Inc. Lucidol Division, Belleville, N. J.
4 Diisopropylbenzene hydroperoxide (50% active). Hercules Powder Co. Wilmington, Del.
5 Paramenthane hydroperoxide (48% active). Hercules Powder Co.
6 Cumene hydroperoxide (72% active). Hercules Powder Co.
7 Tetramethyl thiuram disulfide.
8 ASTM D395-53T, Method B, "ASTM Standards for Rubber Products, December, 1954," American Society for Testing Materials, Philadelphia, Pa.

TABLE 2. HYDROPEROXIDES IN CURING OTHER NITRILE RUBBER

Hycar 1042[1] (LTP medium high nitrile rubber)	100.0	100.0	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0	5.0	5.0
FEF carbon black	40.0	40.0	40.0	40.0	40.0
Stearic acid	1.0	1.0	1.0	1.0	1.0
Dioctyl adipate[2]	—	—	—	20.0	—
Curatives					
DIP	4.0	—	—	—	—
CHP	—	2.5	—	2.5	—
t-BHP	—	—	4.5	—	—
TMTD	—	—	—	—	3.5
Mooney scorch @ 250° F., small rotor[3]					
Minimum Mooney viscosity	49	53	54.5	24	40.5
Scorch time, △5 min.	4.75	4	3.75	3.75	15.0
Cure time, △30 min.	7.75	6	7.75	6.0	>31.0
Physical properties—310° F. cures					
Tensile strength, psi., 30 min.	1860	2110	2470	1560	3010
Modulus, 300%, psi., 30 min.	1100	1420	—	450	1470
Elongation, %, 30 min.	440	400	300	620	510
Shore A durometer hardness, 30 min.	66	68	70	47	67
Compression set, %,[4] 45 min.					
70 hrs. @ 212° F.	39	33	19	41	27
250° F.	49	44	27	51	37
Lupke rebound, %, 45 min.	54	53	53	57	51
Low-temperature brittleness, 30 min.					
ASTM D736-54T,[5]					
pass, ° F.	—80	—90	—80	—80	—60
Fail, ° F.	—90	—	—90	—90	—70
D746-54T,[5]					
pass, ° F.	—65	—85	—70	—85	—55
Fail, ° F.	—75	—95	—80	—95	—65
DeMattia flex, aged 24 hours @ 212° F., pierced 30 min.,[6]					
Flexures to 8 rating	12,000	14,000	2,700	*	57,000
Aged physical properties					
After 70 hrs @ 300° F. in ASTM #1 oil[7]					
Tensile strength, psi.	1560	2080	1150	1610	2340
Change, %	—16	—1	—53	+3	—22
Elongation, %	240	260	130	300	320
Change, %	—45	—35	—57	—52	—37
Shore A durometer hardness	64	66	67	58	62
Hardness change, %	—2	—2	—3	+11	—5
Volume change, %	—1.1	—0.8	—0.5	—13	—0.7
After 70 hrs. @ 300° F. in ASTM #3 oil[7]					
Tensile strength, psi.	1660	1920	1800	1080	2410
Change, %	—11	—9	—27	—31	—22
Elongation, %	300	290	200	310	380
Change, %	—32	—28	—33	—50	—25
Shore A durometer hardness	53	56	64	51	54
Hardness change, %	—13	—12	—6	+4	—13
Volume change, %	+21	+21	+20	+6.3	+21

[1] B. F. Goodrich Chemical Co.
[2] Goodrite GP-233. B. F. Goodrich Chemical Co.
[3] ASTM D1077-49T, "ASTM Standards for Rubber Products, December, 1954."
[4] ASTM D395-53T, Method B.
[5] "ASTM Standards for Rubber Products, December, 1954."
[6] ASTM D813-52T.
[7] ASTM D471-54T.
* Extreme variability in samples run.

TABLE 3. ADDITIVES TO CHP CURE OF NITRILE RUBBER

Hycar 1042	100.0	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0	5.0
FEF carbon black	40.0	40.0	40.0	40.0
Stearic acid	1.0	1.0	1.0	1.0
Curative				
CHP	2.5	2.5	2.5	—
TMTD	—	—	—	3.5
PBNA[1]	—	1.0	—	—
n-Nitroso diphenylamine[2]	—	—	1.0	—
Mooney scorch @ 212° F., large rotor[3]				
Minimum Mooney viscosity	117	126	139.5	101.5
Scorch time, △5 min.	6	8.5	5	>31
Cure time, △30 min.	11.5	>31*	>31*	—
Mooney scorch @ 230° F., small rotor				
Minimum Mooney viscosity	66.5	68	80	55.5
Scorch time, △5 min.	5	6.5	4.5	30.5
Cure time, △30 min.	10.5	29.5	>31*	>31
Mooney scorch at 250° F., small rotor				
Minimum Mooney viscosity	67	66.5	78	51.5
Scorch time, △5 min.	4	5	3	15
Cure time, △30 min.	7	11.5	>31*	>31
Mooney scorch at 280° F., small rotor				
Minimum Mooney viscosity	68	68	89	48.5
Scorch time, △5 min.	2.75	2.75	2	6.5
Cure time, △30 min.	2.75	4	3	12
Physical properties				
Press cured 30 min. at 280° F.				
Tensile, psi.	2000	1690	1000	1080
300% modulus, psi.	1220	1210	750	600
Elongation, %	420	410	440	580
Shore A durometer hardness	67	67	64	67
Press cured 60 min. at 240° F.				
Tensile, psi.	2120	1710	1100	2170
300% modulus, psi	1300	1340	870	1110
Elongation, %	430	390	400	520
Shore A durometer hardness	68	68	67	68
Low-temperature brittleness				
ASTM D746-54T, pass, ° F.	—80	—80	—60	—60
Fail, ° F.	—90	—90	—70	—70

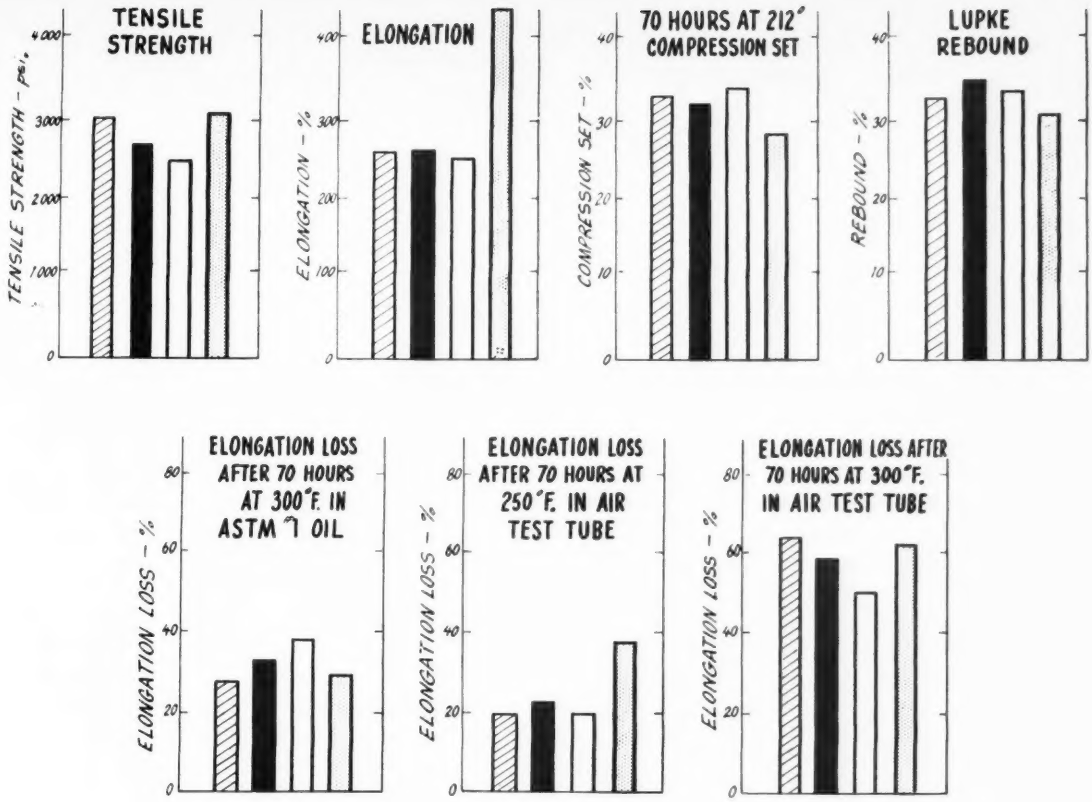
The stocks were remilled after 8 days' shelf aging. All stocks containing CHP appeared scorched, shredding off and forming a lacy sheet during the first passes. After several minutes' milling the batches smoothed out quite well.

Tests on the shelf aged batches follow:

Mooney scorch at 280° F., small rotor[3]				
Minimum Mooney viscosity	105	69	84	33.5
Scorch time, △5 min.	2	2	2	5.75
Cure time, △30 min.	2.5	2.5	2.75	9
Physical properties				
Press cured 30 min. at 280° F.				
Tensile, psi.	2330	2110	1240	2700
300% modulus, psi.	1590	1200	730	910
Elongation, %	390	480	510	680

[1] Phenyl-beta-naphthylamine.
[2] Vultrol, B. F. Goodrich Chemical Co.
[3] ASTM D1077-49T.
* Mooney value began to drop after an increase of more than 5 units above the minimum.

aging the stocks for one month. Although the compounds were difficult to remill after one month because of the scorch, after sufficient remilling to produce a reasonably smooth sheet for vulcanization, no consistent change in stress-strain properties over those obtained originally was noted.



HYCAR 1001	100	100	100	100
ZINC OXIDE	5	5	–	5
STEARIC ACID	1	–	–	1
FEF BLACK	40	40	40	40
CUMENE HYDROPEROXIDE	2.5	2.5	2.5	–
TMTD	–	–	–	3.5

Fig. 5. Physical properties of high acrylonitrile rubber cured in a simplified cumene hydroperoxide compound (plain bar) compared with TMTD cured compound

Simplified CHP System

A high acrylonitrile-level polymer was used to determine the effect of removing ingredients from the already simplified compounding recipe being used. Figure 5 contains the results of that move and demonstrates that a simple combination of polymer, carbon black, and CHP can produce a very acceptable vulcanizate.

Comparison of the resistance to high-temperature aging of the CHP and TMTD cured stocks, as exemplified by elongation change, leads to the conclusion that the CHP cures very nearly equal the TMTD cure in this property. This is all the more remarkable since TMTD is considered to produce one of the best aging vulcanizates obtainable.

Additives to the CHP Cure System

It had become quite evident that the scorch tendency associated with the CHP cure would limit markedly any application of this type of cure. It was felt that two classes of rubber chemicals might have an effect on the undesirable scorch characteristics of the CHP stock.

Accordingly a good rubber antioxidant and an accepted anti-scorch agent were incorporated into the nitrile rubber compounds to be vulcanized with CHP (Table 3). Mooney scorch data show some slight scorch improvement due to the antioxidant, but no improvement resulted from the anti-scorch agent. The tensile strength obtained was slightly poorer in the presence of the antioxidant and considerably poorer when the anti-scorch agent was present. These facts suggest that the antioxidant is not particularly effective in destroying the polymer free radicals responsible for the vulcanization; while the anti-scorch agent is quite effective, since its use results in much lower tensile strength values.

TABLE 4. DICUMYL PEROXIDE IN HIGH ACRYLONITRILE RUBBER

Hycar 1001[1] (high nitrile)	100.0	100.0	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0	5.0	5.0
Stearic acid	1.0	1.0	1.0	1.0	1.0
FEF carbon black	40.0	40.0	40.0	40.0	40.0
Dioctyl adipate	0	0	0	15	0
Curatives					
Dicumyl peroxide[2]	1.25	1.75	2.25	1.75	—
Tetramethylthiuram disulfide	—	—	—	—	3.5
Mooney scorch @ 280° F., small rotor[3]					
Scorch time, △5 min.	2.5	2.75	2.5	2.25	5
Cure time, △30 min.	6.5	5.25	4.25	7.25	10.5
Physical properties—310° F. cures					
Tensile strength, psi., 15 min.	3370	3500	3400	2980	2950
30 min.	3540	3300	3380	3080	3300
45 min.	3330	3300	3300	2070	3430
Modulus, 100%, psi., 15 min.	420	530	670	480	300
30 min.	590	730	920	740	400
45 min.	650	830	1070	780	420
Elongation, %, 15 min.	380	330	270	250	600
30 min.	330	250	220	220	520
45 min.	280	230	200	210	480
Shore A durometer hardness, 15 min.	69	71	72	64	68
30 min.	72	73	75	67	71
45 min.	73	75	76	68	71
Compression set,[4] 45 min. 70 hrs. @ 212° F.	22	16	13	17	28
Low-temperature brittleness, 30 min. ASTM D746-54T, Pass, ° F.	—70	—60	—60	—60	—40
Fail, ° F.	—80	—70	—70	—70	—50
Physical properties—212° F.					
Tensile strength, psi.	1480	1500	1120	1210	1450
Elongation, %	190	180	120	150	280
Modulus, 100%, psi.	390	520	780	550	240
Aged physical properties					
After 70 hrs. @ 300° F. in ASTM #1 oil					
Tensile strength, psi.	3280	3200	3180	2980	3430
Change, %	—7	—3	—6	—3	+4
Elongation, %	260	220	180	180	320
Change, %	—21	—12	—18	—18	—38
Shore A durometer hardness	71	72	74	76	70
Hardness change	—1	—1	—1	+9	—1
Volume change, %	—2	—3	—3	—13	—3
After 70 hrs. @ 350° F.[5] in ASTM #1 oil					
Tensile strength, psi.	2980	2810	2630	2940	2640
Change, %	—16	—15	—25	—5	—20
Elongation, %	220	180	160	160	250
Change, %	—33	—28	—27	—27	—52
Shore A durometer hardness	70	74	75	79	74
Hardness change	—2	+1	0	+12	+3
Volume change, %	—2	—2	—3	—13	—3
After 75 hrs. @ 350° F.[5] in ASTM #3 oil					
Tensile strength, psi.	2010	1330	1900	2280	2480
Change, %	—43	—60	—44	—26	—25
Elongation, %	180	120	120	120	280
Change, %	—45	—52	—46	—45	—46
Shore A durometer hardness	70	73	75	77	78
Hardness change	—2	0	0	+10	+7
Volume change, %	+9	+8	+8	—3	+9
After air test tube immersion 70 hrs. @ 250° F.[6]					
Tensile strength, psi.	3450	3370	3180	2920	3560
Change, %	—3	+2	—6	—5	+8
Elongation, %	250	200	170	180	320
Change, %	—24	—20	—23	—18	—38
Shore A durometer hardness	76	78	79	75	78
Hardness change	+4	+5	+4	+8	+7
After air test tube immersion 70 hrs. @ 300° F.[6]					
Tensile strength, psi.	1580	1630	1310	1500	2230
Change, %	—55	—51	—61	—51	—32
Elongation, %	100	80	60	90	170
Change, %	—70	—68	—73	—59	—67
Shore A durometer hardness	78	80	81	79	75
Hardness change	+6	+7	+6	+12	+4

1 B. F. Goodrich Chemical Co.
2 90-95% Purity, Hercules Powder Co.
3 ASTM D1077-49T.
4 ASTM D395-53T Method B.
5 ASTM D471-54T.
6 ASTM D865-54T, "ASTM Standards for Rubber Products, December, 1954."

Dicumyl Peroxide Vulcanization

Although nitrile polymers vulcanized with cumene hydroperoxide have exhibited interesting properties, the scorchy nature of the stock ruled out all but laboratory or semi-commercial operations. Dicumyl peroxide (DCP), however, has been made commercially available and appears to produce most of the desirable properties produced by CHP in a nitrile rubber vulcanizate. In addition DCP is relatively non-scorchy.

The high acrylonitrile polymer compounded with DCP has a fairly short scorch at 250° F., according to the bar graph of Figure 6; however, the lower acrylonitrile polymers tested have very long scorch times. Tables 4 and 5 present the physical test data obtained from DCP vulcanizates of a high acrylonitrile content polymer and also a medium acrylonitrile polymer. Although the Mooney scorch run at 280° F. also shows greater activity for the high acrylonitrile polymer DCP cure than for the TMTD cure, no scorch tendency was noted during milling or handling of the DCP cured stock.

Tensile Strength

A review of the data indicates that DCP, when 90%-95% purity material is used, yields the best properties at a level of 1.25 phr. in the simple furnace black reinforced, high acrylonitrile polymer recipe (Table 4) and at a 1.75 phr. level with the medium acrylonitrile polymer (Table 5). It is interesting to note that DCP increases the tensile markedly and the elongation slightly over those obtained with cumene hydroperoxide. The tensile strength obtained, when the DCP cure is used, has reached as high as 3,500 psi. and equals the tensile strength produced by the TMTD cure in the case of both polymers.

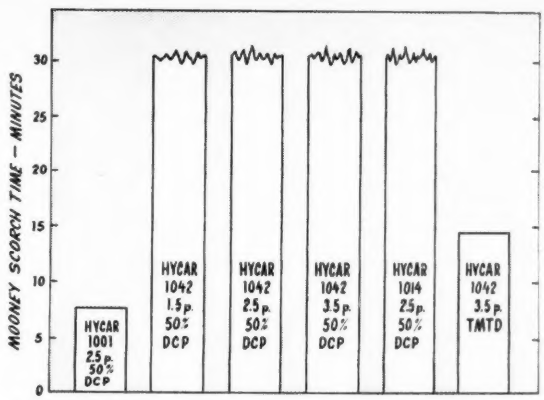


Fig. 6. Mooney scorch time at 250° F. for dicumyl peroxide cured compounds made from rubbers of varying nitrile content, compared with Mooney scorch time for TMTD cured medium high nitrile content compound

Compression Set

Because nitrile polymers are used frequently in products which must maintain a positive seal, compression set is an important property. Dicumyl peroxide at the level selected for best properties produces a vulcanizate with excellent set, very nearly as good as the best set obtainable with commercial sulfur cure systems.

Retention of properties after hot air or hot oil aging generally is good, but on an average not quite equal to the excellent retention obtained with the unusually heat-resistant TMTD cured control.

Low Nitrile Polymer Cures

Although the indications are that the high acrylonitrile polymer cures most rapidly with peroxides and hydroperoxides, a low acrylonitrile content polymer has also been cured with DCP to yield satisfactory stress-strain properties. The results appear in Table 6.

Low-Temperature Brittleness

One of the properties apparently improved by the use of peroxide-type cures has been the low-temperature brittleness. This result was unexpected and, because of the recognized vagaries of the low-temperature brittleness test, was checked many times before any credence was assigned to this unexplained improvement. The evidence now available is almost overwhelming in showing that some low-temperature brittleness improvement may be expected from peroxide cures of unplasticized compounds when compared to standard sulfur cures.

A tabulation of all the low-temperature brittleness data collected on black reinforced unplasticized stocks during the investigation of peroxide and hydroperoxide cures is shown in Table 7. The data are presented as the number of degrees improvement in low-temperature brittleness recorded by the peroxide cure over a TMTD cure run at the same time on the same polymer.

Non-Black Compounds

All properties discussed thus far have been obtained on black reinforced compounds. Table 8 demonstrates

TABLE 5. DICUMYL PEROXIDE IN MEDIUM HIGH ACRYLONITRILE RUBBER

Hycar 1042 (medium high nitrile)	100.0	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0	5.0
Stearic acid	1.0	1.0	1.0	1.0
FEF carbon black	40.0	40.0	40.0	40.0
Curatives				
Dicumyl peroxide[1]	1.25	1.75	2.25	—
Tetramethylthiuram disulfide	—	—	—	3.5
Physical properties— cures at 310° F.				
Tensile strength, psi., 15 min.	2260	2980	2980	2670
30 min.	2600	3130	3110	2900
45 min.	2870	3070	3100	2820
Modulus, 300%, psi., 15 min.	690	1440	—	1080
30 min.	1280	2250	—	1230
45 min.	1500	2490	—	1310
Elongation, %, 15 min.	740	590	400	660
30 min.	540	420	300	620
45 min.	490	370	280	580
Shore A durometer hardness, 15 min.	65	67	68	66
30 min.	68	70	71	66
45 min.	68	70	72	67
Compression set,[2] 45 min. 70 hrs. @ 212° F., %	29	16	13	29
Low-temperature brittleness,[3] 30 min.				
Pass, ° F.	—80	—75	—75	—60
Fail, ° F.	—90	—85	—85	—70
Physical properties measured at 212° F.				
Tensile strength, psi.	1120	1170	1220	1230
Elongation, %	330	250	260	410
Aged physical properties				
After 70 hrs. @ 300° F. in ASTM #1 oil				
Tensile strength, psi.	2630	2900	3000	3080
Change, %	+1	—7	—4	+6
Elongation, %	350	300	240	530
Change, %	—35	—29	—20	—15
Shore A durometer hardness	65	65	69	56
Hardness change	—3	—5	—2	—10
Volume change, %	+1	+1	+1	+1
After 70 hrs. @ 350° F. in ASTM #1 oil				
Tensile strength, psi.	1830	1540	730	1470
Change, %	—30	—15	—77	—49
Elongation, %	220	150	90	220
Change, %	—59	—64	—70	—64
Shore A durometer hardness	69	73	72	61
Hardness change	+1	+3	+1	—5
Volume change, %	+1	+1	+0.2	+0.4
After 70 hrs. @ 350° F. in ASTM #3 oil				
Tensile strength, psi.	1370	1720	1690	980
Change, %	—47	—45	—46	—66
Elongation, %	210	170	150	220
Change, %	—61	—59	—50	—65
Shore A durometer hardness	55	60	63	49
Hardness change	—13	—10	—8	—17
Volume change, %	+29	+27	+25	+28
After air test tube immersion 70 hrs. @ 250° F.				
Tensile strength, psi.	2550	2150	2510	3120
Change, %	—2	—31	—19	+7
Elongation, %	290	200	260	420
Change, %	—46	—52	—13	—32
Shore A durometer hardness	74	75	71	71
Hardness change	+6	+5	0	+5

1 90-95% Purity, Hercules Powder Co.
2 ASTM D395-53T, Method B.
3 ASTM D746-54T.

TABLE 6. DICUMYL PEROXIDE CURE OF LOW ACRYLONITRILE RUBBER

Basic Recipe	
Hycar 1014[1] (low nitrile)	100.0
Zinc oxide	5.0
Stearic acid	1.0
FEF carbon black	40.0
Curative	Variable

Curatives	DCP[2]			DCP			TMTD		
Parts	1.75	1.75	1.75	2.25	2.25	2.25	3.5	3.5	3.5
Physical properties									
Min. cured at 310° F.	15	30	45	15	30	45	15	30	45
Tensile strength, psi.	2070	2320	2330	2280	2290	2500	2560	2430	2510
Modulus, 300%, psi.	1230	1830	2070	1620	—	—	1425	1395	1500
Elongation, %	430	350	320	390	300	280	480	480	440
Shore A durometer hardness	60	62	62	61	63	65	61	62	62
Compression set,[3] 70 hrs. @ 212° F. %			16			13			22

[1] B. F. Goodrich Chemical Co.
[2] Dicumyl peroxide 90-95% purity, Hercules Powder Co.
[3] ASTM D395-53T, Method B.

TABLE 7. IMPROVEMENT IN ASTM D746 LOW-TEMPERATURE BRITTLENESS VALUES FOR PEROXIDE OVER TMTD CURES OF NITRILE RUBBERS

Polymer—Hycar	1001	1011	1012	1042	1014
Acrylonitrile content	High	High	Medium high	Medium high	Low
Peroxidic agent					
t-Butyl hydroperoxide	—	20(1)	30(1)	15(1)	—
Diisopropylbenzene hydroperoxide	—	—	30(1)	10(1)	—
Cumene hydroperoxide	20(2)	—	10(1)	20(3)	—
Dicumyl peroxide	10(2)	—	—	7(4)	10(1)

The numbers represent the improvement in °F. of the peroxide agent indicated over a TMTD cured control. The numbers in parentheses show the number of separate compounds represented in the figure reported.

TABLE 8. DICUMYL PEROXIDE CURE OF WHITE NITRILE RUBBER COMPOUND

Hycar 1001 (high nitrile)	100.0	100.0	100.0
Zinc oxide	5.0	5.0	5.0
Stearic acid	1.0	1.0	1.0
Hydrated silica[1]	40.0	40.0	40.0
DCP	1.25	1.75	—
TMTD	—	—	3.5
Physical properties—cures @ 310° F.			
Tensile strength, psi., 15 min.	3860	3600	4130
30 min.	3440	3490	4170
45 min.	3430	3120	3990
Modulus, 300%, psi., 15 min.	1710	1930	1065
30 min.	2060	2770	1090
45 min.	2000	2430	1215
Elongation, %, 15 min.	500	450	610
30 min.	430	350	600
45 min.	420	370	590
Shore A durometer hardness, 15 min.	72	72	68
30 min.	74	74	70
45 min.	74	75	70
Graves tear,[2] lbs./in., 30 min.	240	210	220
Compression set,[3] %, 45 min. 70 hrs. @ 212° F.	26	23	32
Lupke rebound, %, 45 min.	30	29	34
Low-temperature brittleness,[4] 30 min.			
Pass, ° F.	—25	—25	—40
Fail, ° F.	—30	—30	—45

[1] Hi-Sil 202. Columbia-Southern Chemical Corp., Pittsburgh, Pa.
[2] ASTM D624-54, "ASTM Standards for Rubber Products, December, 1954."
[3] ASTM D395-53T, Method B.
[4] ASTM D746-54T.

that dicumyl peroxide is capable of producing a reasonable vulcanizate of a nitrile polymer reinforced with hydrated silica. Although the tensile strength of the DCP cure was somewhat lower than the tensile strength obtained with TMTD, the former is at a very respectable level. The high modulus and the low compression set of the compound combined with the non-blooming shiny cure expected of DCP vulcanizates may prove to be of value in applications where a white or colored stock is needed.

Results and Discussion

Analysis of the data reveals that cures obtained with dicumyl peroxide possess certain advantages, while, at the same time, a few disadvantages of this unique cure system seem likely. The attributes of the peroxidic cure appear to be:

1. The vulcanizate contains no sulfur or sulfur bearing ingredients.
2. Aging properties are excellent.
3. There is an apparent improvement in low-temperature brittleness.
4. Compression set may be brought down into a very low range.
5. A smooth, shiny vulcanizate completely free of bloom results.
6. Since accelerators and activators are not required simplified recipes may be used.

There are some disadvantages of even the best peroxide cures, and the most important of these appear to be:

1. Elongations are generally somewhat lower than those of good sulfur vulcanizates.
2. There appears to be some sensitivity of the peroxide to certain compounding ingredients.
3. A retardation of oven cures of thin films, due presumably to the large portion of the compound exposed to the air, has been noted.
4. The by-products of vulcanization, and particularly the odor, may be a deterrent in certain applications.
5. The association of hazard with peroxides will almost certainly be a factor in limiting their quick acceptance.

Summary and Conclusions

Several hydroperoxides have been found to produce vulcanizates of nitrile polymers with excellent strength,

(*Continued on page 522*)

A New Era in Synthetics in Rubber to Match Plastics?[1]

By GEORGE R. VILA
Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

The growth rate for the plastics industry is exceeding that for the rubber industry, even though the growth rate for the latter has exceeded that of our overall economy in recent years. According to some predictions, consumption of plastic resins in 1956 may equal the consumption of natural and synthetic rubbers in the United States for the first time in history.

Much of the gain in plastics consumption may be attributed to the wide variety of types of plastic resins available to the fabricator. This situation is in contrast to the relatively few types of rubber that have been available to the rubber compounder. With the synthetic rubber producing industry now under private ownership an ever-increasing number of types of synthetic rubber are expected to be developed, and this increase in variety of available rubber materials could act as a stimulus to the growth of the use of rubber in excess of anything previously experienced.

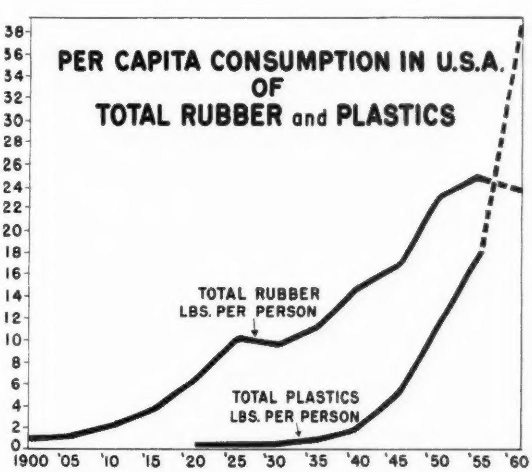


Fig. 1. Per capita consumption (pounds per person) in U.S.A. of rubber (new and reclaimed) and plastics, 1900-1960

FOR a number of years the rubber industry in the United States has been growing at a faster rate than our over-all economy. The plastics industry, however, has been growing even faster, as is shown in Figure 1.

The growth of the use of plastics has even attained such proportions that some experts believe the annual production and use of plastic resins will reach the level of rubber production or imports and use during 1956, in this country. This will occur, they say, somewhere up around the lofty 3.5-billion-pound mark.

Plastics' rapid rise deserves a close look from the rubber industry for many reasons. One of the reasons is that many markets formerly dominated by rubber have gone over to plastics. Garden hose is the first good example of this change; wire insulation is a second, and coated fabrics, a third. (Figure 2). While this should not be a cause for great concern among rubber firms, since many of them are also in the plastics business, a review of the factors behind the popularity of plastics products could profit rubber goods producers.

Fig. 2. Comparison of certain products made from rubber, left, and plastics, right. Model is wearing raincoat made from plastics

[1]Based on a paper presented before the annual meeting of the RMA Molded, Extruded & Sponge Rubber Subdivision, Hot Springs, Va., June 16, 1955.

Plastics vs. Rubber Materials Progress

A basic reason perhaps, for the success of the young and dynamic plastics materials manufacturing industry is the broad variety of raw materials it offers the fabricator. The end-product maker can select just the material needed for his particular job, and he can base his choice on economy, strength of the base material, the finished appearance of the product, or a combination of these factors, among others.

In contrast to this, look for a moment at the situation in rubber. Until the early 1930's the rubber industry was limited for all practical purposes to one source of rubber, the product of the *Hevea brasiliensis* tree. Admittedly, the industry achieved miraculous results in extracting the maximum in properties from natural rubber through the development of accelerators, antioxidants, reinforcing pigments, and fabricating techniques for use with it. But the starting point for the rubber industry was still a single type of rubber.

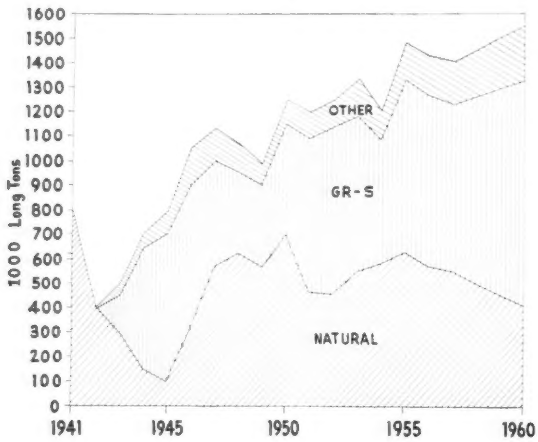


Fig. 3. Rubber use pattern by types, 1941 through 1960

In the early 1930's neoprene, nitrile rubbers and Thiokols entered the market. These new rubbers allowed the industry to break out of its one-type shackles, at least in areas where oil-resistance was important. While this was an important milestone, only a small amount of the total rubber hydrocarbon used was actually involved.

Then with World War II the horizon of the rubber industry was pushed farther out by the introduction of GR-S type rubber. (Figure 3.) While this achievement was a major one, the emphasis in synthetic rubber research for many years was to develop a product that duplicated natural rubber as closely as possible. The aim — in other words — was to extend rubber supplies rather than to bring new types of rubber into the economy.

Gratifying progress was made in synthetic rubber during the war and in the immediate postwar years. We saw the development of the cold polymerization process, the carbon black masterbatch, oil masterbatches, and many other improvements. As a result, there are types of synthetic rubber that are now superior to natural rubber in some applications, notably in passenger-car tire treads.

Still GR-S was shackled for some time. Because it was produced under government supervision, it lacked the keen competitive spirit of private enterprise. Now, within the past few months, that picture has changed.

Today synthetic rubber is in private hands. Many companies are now in the field, including some who were primarily rubber fabricators previously. Many minds, spurred by the incentives of private enterprise, are now free to develop new types of rubber, improve older types, and increase rubber production.

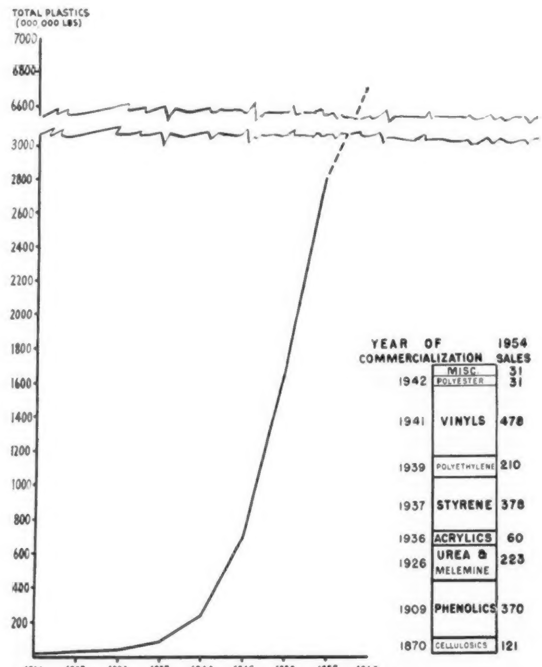


Fig. 4. Plastic resin sales 1920-1960, by types, with year of commercialization. (These figures are taken from the latest (December 7, 1955) report of the U. S. Tariff Commission, but do not include resins consumed in protective coatings)

There are already reports of large sums of money being earmarked for synthetic rubber research. It is estimated that private companies, collectively, will soon be spending synthetic-rubber research dollars at a faster clip than the government, which spent $27 million on synthetic rubber research over the last five years. We also hear talk of new monomers and new production techniques. So we may well be on the threshold of a new era for rubber, an era of variety of types. But plastics, in contrast, seem to have had a variety of types almost from the start.

The impact of variety, or many types, was felt in the plastics industry during the 1930's. (Figure 4.) The phenolics and the ureas, both of which are still important and growing vigorously, were developed prior to this time. Then in the Thirties came polyvinyl chloride,

which has exhibited a phenomenal growth and is today's biggest selling plastic material. It was followed by polystyrene, the acrylics, polyethylene and the polyesters. In addition, many other plastic materials have been developed for special uses.

This array of materials, capable of doing a broad range of jobs, gave the plastics materials manufacturing industry a tremendous sales boost. With this variety of plastics they could approach many fabricators, including some who had never even thought of using plastics before, and demonstrate that plastics could do an excellent job for them.

The variety of types was also a spur to competition within the plastics materials industry. No manufacturer made all of the types of plastics; so individual firms could concentrate on improving just one, or possibly a handful, of the types of plastics. This intensification of research improved all of the types, and it also amounted to a wide-scale hunt for new plastics.

This vigorous spirit of competition within the materials branch of the industry has paid off handsomely. Table 1 tells in pounds the success story of the highly competitive plastics manufacturing industry. It shows how long it took various types of plastics to reach the 50 million-pound mark, and the relatively short space of time required thereafter for each type to be pushed into the 100 million-pound category. An interesting sidelight is that only one of the types required estimated figures.

TABLE 1. PLASTIC MATERIALS USE

Type	0 to 50 Million Lbs.	50 to 100 Million Lbs.
Cellulosics	70 years	3 years
Phenolics	26 years	5 years
Ureas	16 years	5 years
Vinyls	14 years	2½ years
Styrenes	14 years	1½ years
Polyethylene	10 years	1 year
Polyesters	10 years*	3 years*

*Estimated

How have these sales records been written? To answer this question it is necessary to look first at our economy in the United States today. We are faced with constant pressure for higher wages; and if wage increases are not to result in inflation, then productivity must be steadily raised. So to explain rising plastic sales, we must see how plastics fit the need of higher productivity per manhour.

Plastics Preferred

There are four fundamental ways to increase productivity: (1) through the use of more efficient tools; (2) through the use of more energy from nature's stores; (3) through more efficient organization of man's efforts, and (4) through the use of more efficient materials.

It is into the last category—more efficient materials—that plastics fit. A more efficient material is a material that requires less energy to shape into a given end-product, while still giving all of the physical properties desired. Plastics, which require less heat, power, and manhours to shape, can be described as among the most efficient of materials in this respect.

So hitting hard on the efficiency of its materials, the plastics materials industry has invaded many markets that have traditionally been the province of older materials. We find plastics competing with rubber, textiles, metals, leather, and ceramics. Tables 2, 3, 4, and 5 give some statistics on these competitive battles for existing markets—the area in whicn plastics materals have made most of their gains.

TABLE 2. PLASTICS VS. RUBBER PRODUCT PRICES

	Plastic		Rubber	
	Price	Wgt.	Price	Wgt.
Garden Hose (25 ft.)	$4.90	2½ lbs.	$4.95	6 pounds
Footwear (pr.)	3.95		4.49	
Wire (ft.)	0.03		0.03	
Raincoat	3.98		8.95	
Fountain pen	1.00		3.00	
Comb	0.10		0.15	

PLASTICS VS. FABRIC PRODUCT PRICES

	Plastic	Fabric
Shower curtains	$2.29	$6.98
Drapes	1.98	5.98
Upholstery material	2.50 sq. yd.	4.00 sq. yd. & up
Place mats	0.29-1.00	0.29 & up
Collar	0.45	0.50
Apron	0.69	0.89

TABLE 3. PLASTICS VS. METAL PRODUCT PRICES

	Plastic		Metal	
	Price	Wgt.	Price	Wgt.
Lawn-mower wheel	approx. $1.50		$3.00	
Pipe	approx. 1.20 ft.	6 oz.	.58 ft.	3¾ lbs.
Fish rod	3.25		6.50	
Toy	2.98		3.98	
Ice tray	0.50		1.95	
Ice bucket	7.95		17.00-25.00	
Screening	0.08		0.09	

TABLE 4. PLASTICS VS. LEATHER PRODUCT PRICES

	Plastic	Leather
Upholstery material	$4.00 sq. yd.	$16.00-20.00 sq. yd.
Football helmet	23.65	20.00
Shoe soles	0.65	1.40 pr.

TABLE 5. PLASTICS VS. GLASS AND CERAMICS PRODUCT PRICES

	Plastic	Glass-Ceramic
Wall tile	$0.75 sq. ft.	$ 0.75 sq. ft.
Bottle	1.75	0.35
Dishes (set-20 pcs.)	15.95	14.00-37.00

You will note that price has been highlighted in most of these statistics, but plastics can't be regarded as lower-priced materials in all applications. Take plastic pipe, for example. Plastic pipe is a good bit more expensive per foot than its metal counterpart, but is making inroads in the pipe field because it has better corrosion resistance, and its lightness is a cost-saving factor both in installation and shipping.

Another example of higher price being offset by improved properties can be found in the squeeze-bottle field. Polyethylene has had remarkable success in this area despite its relatively higher cost, because it allows bottle makers to offer an unbreakable container that is squeezable.

In the case of garden hose, plastic is winning out because of its lightness and more attractive appearance. A 25-foot coil of vinyl plastic hose or rubber hose can be bought for approximately the same price. But the rubber hose weighs six pounds, compared to $2\frac{1}{2}$ pounds for the plastic hose. In addition, the plastic hose can be made in a variety of transparent or opaque colors. So we find more and more of the garden hose business going to plastic each year.

Price alone, of course, is the reason for the use of plastics in many applications. Take plastic raincoats, for example. Here we find that plastic is considerably less expensive and also gives the added advantage of lightness. Durability is admittedly sacrificed when plastics are used, but there are many instances where the greater durability of a rubber raincoat is not needed.

Other examples where price has played a major role in the swing to plastics is in shower curtains, drapes, upholstery materials, place mats, aprons, and similar items. In each instance we find plastics being used because they work as well as other materials and at a lower initial cost.

In all of these cases the plastics industry has developed material that is better than existing materials for certain applications and then has aggressively pushed its use. In contrast, the rubber industry has sought to improve a relatively narrow range of materials and to find new uses for these materials.

New Uses for Rubber

The rubber industry has had some successes in its search for new uses for its existing materials. Rubber in roads, or "rubber roads," is perhaps the new use that has caused most talk. Here rubber is used as a binder for asphalt, making the material watertight and decreasing annual maintenance costs. It is a long-range potential, for road materials must prove themselves over a considerable stretch of time. But tests of rubber in roads are becoming increasingly available with time, and results look promising. This market could be sizable, for few will contest America's need of better roads.

There is also a new use for rubber in which an existing type of rubber has been teamed with a plastic to create a new molding material. Styrene-butadiene copolymers are now being used to fabricate pipe, and many other molded products. Light, sturdy, and highly corrosion resistant, these new rubber-plastics have already found a market. Miles of pipe made from the material are now being used to transport chemicals, natural gas, salt water, and other materials. Thousands and thousands of home-owners are also pushing lawn mowers that are equipped with wheels molded from this material.

Summary and Conclusions

These new applications are only indications of what is to come now that synthetic rubber is being produced by private industry. For synthetic rubber holds the possibility for the creation of a broad range of new types of rubber. Research efforts are now being concentrated on this project of finding new rubber types. The efforts are being spurred, too, by world demand for rubber which is forcing the industry to retreat further and further from its dependence on natural rubber.

New types of rubber will allow the industry to adopt many of the techniques plastics have used in its battle for markets. The end-result should be a more spirited competitive atmosphere between the two industries, and —quite possibly—a stimulus to further growth in the plastics industry and the beginning of a period of growth in the rubber industry far beyond anything previously experienced.

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Peroxide Cures

(Continued from page 518)

low-temperature brittleness, compression set, and retention of properties after hot air or hot oil aging. In each case the tendency of the compound to scorch has been a major problem.

Dicumyl peroxide has produced the desirable properties obtained with the hydroperoxides along with acceptable scorch characteristics. The vulcanization of nitrile polymers, and undoubtedly other olefinic polymers, with dicumyl peroxide can result in an excellent product possessing the attributes of heat-resistant sulfur cures plus a non-blooming, non-tarnishing stock with possible advantages in low-temperature brittleness and compression set.

Acknowledgment

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Linear Compound Gets Nod

Linear, Inc., Philadelphia, Pa., has revealed that its compound 7402-70 has been approved by the Air Force for conformance to MIL-P-18017A, a specification that establishes the requirements for packings used in aircraft hydraulic systems with MIL-O-5606 fluid at temperatures ranging from —65 to 275° F. Full production of rings to this and other military specifications is said to be available.

EDITORIAL

Rapid Commercialization of Synthetic Polyisoprene—How Best to Accomplish?

THE Special Commission for Rubber Research of the National Science Foundation, which was authorized in May, 1955, as a result of the recommendation of the Rubber Producing Facilities Disposal Commission in January, 1955, submitted its report on December 5, last. Entitled "Future Role of the Federal Government with Respect to Research in Synthetic Rubber," this report would seem to be generally acceptable to both government and industry leaders concerned.

Among the findings in the Commission's report are that government sponsored research is no longer necessary to provide a foundation for the industrial development of a natural rubber substitute, but that government, at its highest levels, should give consideration to the question: "Does the national security require governmental action to foster the industrial development of the new process for synthesizing 'natural rubber?'"

Goodrich-Gulf Chemicals, Inc., and the Firestone Tire & Rubber Co. recently revealed in some detail the results of their research and development work by which synthetic polyisoprene with a molecular structure duplicating that of *Hevea* natural rubber was prepared. Possibly of even greater importance was the report that truck and bus tires made from synthetic polyisoprene have been found to be about equal to those made of natural rubber. The Goodyear Tire & Rubber Co. has also announced the successful synthesis of polyisoprene with a molecular structure closely resembling that of natural rubber.

The NSF Rubber Research Commission's report also states that "economic conditions may provide an environment under which commercial development of the new processes for making natural rubber substitute will move forward without governmental action." Goodrich-Gulf, Firestone, and Goodyear have informed RUBBER WORLD that they feel that there is no need of governmental help and that competitive free enterprise, if unhampered, will make the new polyisoprene rubber available in the shortest possible time.

It might be worthwhile, nevertheless, to take a good look at the recommendation that the government aid the rapid commercialization of synthetic polyisoprene in the interest of national security, in view of the far-flung aspects of this new development.

The government might contract to purchase a sizable tonnage of synthetic polyisoprene for the strategic stockpile at a price sufficient to enable the producing companies to expand their production facilities at a more rapid rate than they might normally do. As soon as the new synthetic natural rubber has demonstrated its seeming ability to substitute for *Hevea* natural rubber in the area where the latter is still necessary, each ton of synthetic polyisoprene added to the stockpile might permit the removal of a ton of natural polyisoprene. The cost to the American taxpayer for the development of complete self-sufficiency in rubber in this country, in the shortest time, would therefore be considerably reduced.

In any event, it is the opinion of the editor of RUBBER WORLD that facilities for the production of at least 250,000 long tons yearly of synthetic polyisoprene should be built as soon as possible. For the first time in history the United States appears to be able to eliminate its dependency on foreign sources of rubber, from the national security viewpoint at least.

R. G. Seaman

EDITOR

Meetings and Reports

Akron Group's "Automation—Rubber Manufacturing" Symposium Draws 800

The fall meeting of the Akron Rubber Group, which featured a symposium on "Automation—Rubber Manufacturing" for its afternoon technical session and a talk on the "St. Lawrence Seaway Project," by Martin W. Oettershagen, deputy administrator, St. Lawrence Seaway Development Corp., attracted an attendance of 800 members and guests. The meeting was held October 28 at the Mayflower Hotel, Akron, O.

Panel members for the afternoon technical program and their subjects were: Andrew Hale, Hale & Kullgren, Inc., "Material Preparation Including Automatic Compounding, Mixing and Pelletizing"; Donald A. Comes, Farrel-Birmingham Co., Inc., "High-Pressure Mixing Banbury, Calendering and Tubing"; George P. Bosomworth, Firestone Tire & Rubber Co., "Fabrication"; Joseph Torrey, The Goodyear Tire & Rubber Co., "Tire Curing"; and John Brothers, Ohio Rubber Co., "Mechanical Goods." L. M. Baker, The General Tire & Rubber Co., was the moderator for this program.

A suppliers cocktail party was held between the afternoon and evening sessions.

The Dinner Meeting

Kenneth R. Garvick, chairman of the Group, presided at the dinner meeting. First, a plaque was presented to V. L. Petersen, Goodyear, in appreciation of his work as chairman of the Group in 1954.

The four winners of the Akron Group scholarships at the University of Akron, John Foght, Thomas Dudek, John Satterfield, and Robert Seaver, were next introduced.

The chairman mentioned the series of lectures on rubber compounding started in October at the evening division, University of Akron, sponsored by the Group, and introduced C. E. Carlson, General Tire, who is supervising this course.

Membership in the Akron Group, as of October 28, was reported as 1,328, compared to 1,251 a year ago.

In his talk, Mr. Oettershagen first explained that Canada has been operating an ocean-going seaway for 100 years. The present 14-foot channel from Montreal to Lake Ontario handles about 10 million tons of freight annually; whereas in 1959, when the St. Lawrence Seaway is scheduled to be finished, 36½ million tons of cargo are anticipated. By 1965 the amount of cargo handled should be as much as 52 million tons.

The St. Lawrence Seaway is a joint American-Canadian project and will cost about $600 million. It is expected to be of great economic benefit to the Great Lakes area, including Akron. The Seaway will raise the capacity of general cargo ships five times and bulk cargo capacity ten times by providing deeper channels.

The design work on the Seaway locks is being done by the U.S. Army Engineer Corps because of their experience and background in this field. Fifty million cubic yards of earth will be dredged from the river in the 15-mile area extending from Ogdensburg, N. Y. Another 23 million cubic yards of earth will be excavated in changing part of the present channel. About 30,000 acres of land are being acquired on the American side of the river and about 37,000 acres on the Canadian side. The Seaway project will provide a 27-foot deep channel from the Great Lakes to Montreal. From Montreal to the sea, the river is 35 feet deep.

The speaker illustrated his talk with numerous slides showing the Seaway route, locks, and surrounding countryside. He urged his listeners to visit the area during the next two or three summers because of the magnitude and the scope of the engineering work which is involved in the project.

"AUTOMATION—RUBBER MANUFACTURING" SYMPOSIUM

Introduction

By L. M. Baker

The General Tire & Rubber Co.

"Automation — Rubber Manufacturing," was selected as our subject for this afternoon's discussion because of its great and timely interest. Automation means one thing to some persons and entirely different things to other persons. Some definitions of automation, as we understand it in the rubber industry, will be given by the speakers on our panel this afternoon.

From all the publicity one might expect that automation is something entirely new and that great progress is being made only in the other industries, such as the automotive, electrical, radio, and TV industries, for example. It seems worthwhile, therefore, to take a look at the rubber industry to determine *where we stand today* and to appraise our prospects for the future. These are the *main purposes* of our meeting.

As you well know, automation and its effects are being considered from many points of view or angles. The scope of our discussion today is concerned with these areas involving technological, engineering, and production problems. It is not our intention to discuss the many facets of automation, such as are being investigated currently by Congressional committees.

Our program this afternoon will consist of two parts. We will first have talks by five experts in the field, on the various applications of automation, and then the panel will answer the many questions which you have forwarded to the program committee.

Material Preparation Including Automatic Compounding, Mixing, and Pelletizing

By Andrew Hale

Hale & Kullgren, Inc.

Fourteen years ago a paper entitled "The Mill Room of the Future" [1] was presented at a meeting of the American Chemical Society's Rubber Division in St. Louis. Later in the year the same paper was delivered to quite a few rubber groups, and before long the paper became known as a description of the "One-Man Mill Room." Strangely enough, the general forecasts made in this paper have by now become realities, and many developments in the way of conveyors, machines, and electric controls have made possible a fully automatic operation in the compounding and mixing areas of present-day rubber goods plants.

The word "automation" is a very recent term and was coined but a few years ago. As a matter of fact "automation" has been going on for many years and becomes more and more complete as materials and equipment for automatic handling of materials are perfected.

It might be interesting to know that in one particular company, automatic operation has attained such a degree of per-

[1] India RUBBER WORLD, June, July, and Aug., 1941.

Moderator, left, and the five members of the panel

fection that it is not even a "One-Man Mill Room," but a "One-*Woman* Room."[2] This young lady, through a master control, is actually weighing all pigments and operates two #11 Banbury mixers. The labor saving with this-type operation is obvious, but what is more important is that the batches are very uniform in total weight because of the uniform weights of the ingredients.

Oils

Today it is modern practice in compounding departments to create what is called a "tank farm" which is composed of various sizes of process oil tanks located near the truck or rail receiving dock. The process oils used in large quantities are drained from drums. The advantage of a "tank farm" is that oils may be delivered in tank cars rather than in drums. Drums require more handling, and their return transportation adds to the cost of the oil.

From the "tank farm" the oils are pumped to smaller reservoirs located directly over the Banbury mixer hopper, and the use of steam tracer lines insure free-flowing liquids at all times. From the reservoirs the oils pass through scales which are set for required weights and which then deliver directly into the Banbury mixer chamber.

The handling of drums in and out of the compounding area is being eliminated, and the manual transfer of oils from reservoirs to the open hopper of the Banbury mixer is becoming a thing of the past. Labor is reduced; uniform weights of oil for each batch are guaranteed; and, finally, dripping containers and soiled floors give way to clean working conditions.

Suppliers of carbon blacks and pigments have improved the physical qualities of their products to such extent that they can also be handled direct from freight car and into the Banbury mixer chamber. Only a few blacks must be delivered to the Banbury loading area in bag form. Successful bulk handling systems for carbon black are of the belt and bucket type, zipper belt and pneumatic or air propelled systems. The black can be stored in huge bins outside of the plant that hold 10 or 12 carloads of black and as many as 12 different types, without contamination.

An operator at a control board can route any one of these various types of black from its outside storage compartment to reservoirs, or surge hoppers located over the Banbury mixer hopper. In many cases as many as four different types of black are available at the Banbury. One, or a combination of types, is automatically fed to a scale which delivers the black directly into the mixing chamber and at the prescribed time during the mixing cycle.

The mechanized handling of black from car to mixing chamber eliminates trucking of bags to the Banbury loading area, manual handling, and weighing. Air pollution, furthermore, gives way to a clean and wholesome atmosphere throughout the entire plant.

Air pollution due to escaping black from the mixing chamber has been eliminated by a new type of dust control. Some companies are installing individual systems which permit movement of higher quantities of dust-laden air. Such systems insure the return of powders to their respective batches which have heretofore become waste material.

The benefits of bulk handling can only be derived from free-flowing pigments used in large volume, and for the time being this seems to be limited to carbon black of various grades. In one or two instances the bulk handling of clay has been fairly successful. Other pigments used in lesser quantities are still being unloaded from freight cars or trucks in bags and on pallets, and these are conveyed by elevator or mechanical conveyor from the receiving platform to the storage floor over the compounding area through which protrude the tops of the hopper bins. In most plants, considerable savings can be made by consolidating the storage areas for raw materials at the place where they are ultimately used.

Rubbers

The storage of rubbers of various kinds should also be consolidated as much as possible. The masticating and pelletizing of both natural and synthetic rubbers are now common practice with some companies. Pellets can be conveyed by air through pipes to the storage area directly above the Banbury mixers. Here the rubber pellet bins, which protrude through the storage floor, are filled with their respective rubber pellets for serving the scales in the compounding room. In one or two instances suppliers of reclaimed rubber supply their product in pellet form and transport it in special trucks equipped with a special hose connection and means of delivering the material to the respective bins.

Automatic Weighing and Handling

The very heart of the automatic mill room consists of automatic scales of various types and sizes that will handle carbon black, process oils, rubber or reclaimed rubber pellets, bulk pigments, and the smaller volumes of such materials as sulfur, antioxidants, and accelerators. In case of carbon black, one scale can draw from at least four surge hoppers delivering as many as four types of black to the mixing chamber in a few seconds' time. This procedure is also possible with staining and non-staining oils and with rubber pellets. It is not necessary, therefore, to provide a scale for each bin. In cases of pigments used in small quantities, one scale can serve as many as 12 different bins and hence deliver quite a large assortment in but a few seconds' time.

Except for carbon black and oils which are fed directly into the mixing chamber, the other ingredients are weighed and then delivered to a common conveyor which delivers the material to the mixer hopper.

Current engineering work is being directed toward reducing initial costs of automatic compounding. The trend is toward a centralized compounding system which will serve a number of mixers with automatically weighed-out batches.

A program cycle controller determines the times at which the various ingredients should arrive and be loaded into the mixer. It raises and lowers the floating weight, opens and shuts the hopper door, and finally opens and closes the discharge door for discharge of batch from mixer at the correct time or at the proper temperature. The closing of the discharge door is a signal to start feeding the next batch and energize the Banbury cycle controls.

The nerve center of compounding and mixing consists of a large control board having remote dial settings for weighing each ingredient, also program control for the Banbury operating cycle. The two controls are interlocked and so coordinated that the correct ingredient is available when needed during the mixing cycle.

When the system is ready for operation, a counter is set for the required number of batches of this particular formula. That setting is all the operator is required to do except watch for danger signals which can indicate a flow stoppage, insufficient material, or failure of some part to function. In such rare instances the entire system is

[2] Rubber World, June, 1955, cover.

stopped until repairs or corrections are made. The danger signals flash the exact location of the trouble.

Obviously this talk is covering a lot of technical ground with a few sentences, and time does not permit elaboration or full description of all these mechanisms. Be assured, however, that none of the above discussion is merely a prediction as it was 14 years ago, but such systems are actually in operation in progressive rubber companies.

Handling Final Compound

The last subject to be covered by this paper is the handling of the batch as it leaves the Banbury, and this can be done either with a pelletizer, which will put the rubber into pellet form for easy cooling and conveyance, or it can be automatically cut to length and stacked on a skid. Either arrangement eliminates the sheeting mill and an operator.

The next paper deals with short-cycle mixing in the Banbury mixer which has been made possible by higher rotor speeds and greater pressures exerted on the batch. It appears, therefore, that production from the mill room depends entirely upon services to and from the mixer and not by the mixer itself.

Opportunities exist for automation in small as well as large plants. The extent to which it is applied depends upon scheduling and reduction in variety of formulae used in a given plant. With a positive approach, a progressive attitude, open mindedness, and determination, many plants can enjoy rewards, beyond all expectation, by using these latest materials and compound handling systems.

High-Pressure Mixing Banburys, Calendering and Tubing

By Donald A. Comes

Farrel-Birmingham Co., Inc.

I have been asked to give a short talk on high-pressure mixing, and although I am probably the one who applied this name to it, I believe it would be more accurate to call it high-horsepower mixing. High-pressure mixing is based on the principle that the more horsepower applied to any mixing job when the mix is in its stiffest state, the better the dispersion, and an investigation of high-pressure mixing was started in order to improve the dispersion of the ingredients in the mix, not simply to increase production. The resulting increase in production developed as an extra dividend when this high-pressure mixing process was used.

Early Use of High-Horsepower Mixes

This work started because we had a size 3A Banbury mixer set up in our laboratory with a DC motor which provided 10-100 rpm. on the rotors and a 16-inch air cylinder using 200 pounds of air which produced a pressure of 160 psi. on the floating weight. At that time we were using this machine for devulcanization of completely vulcanized rubber such as whole tires, both defibered and with the fiber still present and also for devulcanizing partially cured stock, which is found in various plants and is generally known as morgue stock.

One of these so-called 3A reclaiming Banbury mixers was sold to the Dasher Rubber & Chemical Co. in Fairport Harbor, O., and Dr. Dasher has worked out several other interesting uses for this extremely high-speed, high-horsepower, and high-pressure unit. These processes cover the grinding of vulcanized rubber and also the grinding of unvulcanized rubber or raw rubber of all types. Dr. Dasher has taken out several patents on these processes, and they are being handled by Patent & Licensing Corp., New York, N. Y.

It was the availability of this new 3A reclaiming Banbury that started our work in connection with its use for regular compounding, employing all or part of the speed, pressure, and horsepower available in this machine. As a comparison, the standard 3A Banbury mixer rotors operate at 35 rpm. and have 20 psi. on the floating weight and a connected load of 150 hp.; whereas the reclaim Banbury mixer rotors operate at 100 rpm. and have 160 psi. on the floating weight and a connected load of 600 hp.

FB Laboratory Development

We do a great deal of compounding for customers in our laboratory, using the regular convention formulae and often very unconventional formulae. Over the years we would often try using the higher horsepower on our laboratory Banbury mixers with amazing results.

At one time we took a complete tire tread formula using GR-S type rubber, but did not add the accelerator and the sulfur. This compound was dumped into the high-speed, heavy-pressure, high-horsepower Banbury and discharged when a certain temperature was reached. The temperature picked in this case was 280° F., and the batch was dumped in 45 seconds, and a very good mix was produced in that extremely short time. After discharge, the mix was sheeted, cooled, and returned to this same mixer; the accelerator and the sulfur were added, and the batch was discharged at the end of 20 seconds in order to keep the temperature from going too high.

Results and Discussion

The above experiment demonstrated that for regular compounding we were using too high a speed, too much pressure, too much horsepower, and too short a time cycle. We began work to find what the proper horsepower, speed, and pressure should be for a Size 11 Banbury. We have arrived at a rotor speed of about 40 rpm., which is twice the standard rpm.; a pressure on the floating weight of approximately 75 psi., which is only three times normal pressure, not the eight times normal pressure as used in reclaiming and devulcanizing; and we have found that 800 hp. probably is sufficient for the general run of stocks.

It must be remembered that the horsepower used is governed by the type of stock to be mixed in the Banbury. If considerable processing oil is used in the compound, not so much horsepower is required. We also feel that a mixing cycle of two minutes is probably short enough.

When I say that high-pressure mixing is really high-horsepower mixing, I mean that the high horsepower is obtained by a combination of high rotor speed and higher-than-normal pressure on the floating weight. The first Banbury mixer had a pressure of 12 psi. on the floating weight. Today the standard #11 Banbury mixer with an 11-inch cylinder and using 100 pounds has a pressure of 25 psi. on the floating weight. High-pressure mixing uses three times the 25 psi. or 75 psi. on the floating weight. Reclaiming and grinding use more than 10 times the original pressure of 12 psi., or a pressure from 150 to 165 psi.

If a standard installation has horsepower still available over and above that required for regular mixing, some degree of high-pressure mixing can be obtained by increasing the rpm. of the rotors, and increasing the pressure of the ram.

Most Banburys, however, are already overloaded. The history of speeds and horsepower used over the years follows:

Banbury Type	Horsepower	Rpm.
(1) #11	200	20
(2) #11	250	20
(3) #11	250/500	20/40
(4) War	300/600	20/40
	300/450/600	20/30/40
(6) Uni-Drive	750/1500	20/40
(5) Uni-Drive	400/800	30/60

Summary and Conclusions

Summing up, I think these following conclusions are justified:

(1) High-horsepower or the so-called high-pressure method of mixing is basically sound.

(2) The customer can use as much of this high-pressure type of mixing as he feels applies to his particular formula and process.

(3) On stiff stocks (such as for tires) high-pressure mixing will cut the cycle approximately in half.

(4) Pressure is most important for stiff stocks.

(5) Rpm. of the rotors is most important on soft stocks.

Some of the troubles encountered with high-pressure mixing are:

(1) Most loading methods now being used for Banbury mixers are too slow when short-cycle mixing is employed.

(2) The mill underneath the Banbury is often unable to handle the greater short-cycle mixing output.

(3) A screw machine of some type is needed in order to handle the high output from short-cycle Banbury mixing.

(4) This screw machine can have either a pelletizing head or a slab extruding head to handle the stock from the Banbury.

(To be continued)

Rhode Island Rubber Club Panel Discussion on Butyl Rubber—I

The fall meeting of the Rhode Island Rubber Club held at the Pawtucket Country Club, Pawtucket, R. I., on December 1, featured an afternoon technical session in the form of a panel discussion on butyl rubber, a cocktail hour, and a dinner-meeting at which the Scotch humorist and lecturer, John Nicol Mark, spoke.

The panel discussion was attended by about 150, and the dinner-meeting attendance totaled 225. At a short business meeting after dinner the following officers and directors were elected for 1956: chairman, Raymond Szulik, Acushnet Process Co.; vice chairman, Gilbert Enser, Collyer Insulated Wire; and secretary-treasurer, Kenneth Priestly, United States Rubber Co. Directors were elected as follows (term in parentheses): Webb Day, E. I. du Pont de Nemours & Co., Inc., (one year); Walter Blecharczk, Davol Rubber Co. (two years); Harry Ebert, Firestone Tire & Rubber Co. (three years); Edwin C. Uhlig, U. S. Rubber (four years); and Ralph Robitaille, Phillips Chemical Co. (five years). Roy G. Volkman, U. S. Rubber, was elected permanent historian of the Club.

Retiring Chairman Urbain J. H. Malo, Crescent Corp., was presented with a fine leather wallet and a box of cigars by the Club in appreciation of his services in '55.

THE PANEL DISCUSSION ON BUTYL RUBBER

Moderator for the panel discussion on butyl rubber was W. H. Peterson, Enjay Co., Inc. The five members of the panel each gave a short talk, after which they answered certain questions pertaining to the subject of their talk.

The speakers and their subjects follow: R. M. Thomas, Esso Research & Engineering Co., "Introduction—Composition and Method of Manufacture"; William H. King, Acushnet; "Butyl Rubber in Mechanical Goods"; Emil W. Schwartz, Southern Clays, Inc., "Butyl in Wire & Cable Extrusions"; Carl H. Lufter, B. F. Goodrich Chemical Co., "Brominated Butyl Rubber"; and George A. Barclay, Xylos Rubber Co., "Butyl Reclaim."

In addition to the questions answered by various members of the panel, certain other questions were submitted to and answered by a technical representative from Enjay Co. These questions and answers, properly designated, will be found at the end of this report.

W. H. Peterson

Introduction—Composition and Method of Manufacture

By R. M. Thomas

Esso Reseach & Engineering Co.

This year (1955) is the fifteenth anniversary of the announcement of the discovery of butyl rubber. During the past ten years all of us have come to know this unusual product as an inner tube rubber because of its superior ability to hold air and maintain good physical properties during service. During the coming years we expect you to know the rubber on the basis of more widespread usage and volume production. Its general properties and favorable economics resulting from its use in the rubber industry offer opportunities of exceptional promise. In introducing butyl rubber to this meeting, therefore, let us consider its background with regard to chemcial composition and method of manufacture.

Butyl rubber is made by copolymerizing two by-products from the cracking of petroleum, isobutylene and isoprene.[1] By such copolymerization it is possible to join a large number of small molecules together to make one unit which is long and thread-like and where approximately 10,000 starting molecules join together to make a single unit. From the structure of the end-product it may be noted that isobutylene joins head to tail and that isoprene enters the picture predominently by 1-4 addition. It should be emphasized that the butyl polymer is composed mainly of isobutylene, having only one or two mol % of isoprene present. This type of polymer provides enough unsaturation to make the rubber vulcanizable without making it vulnerable to attack by chemical agents such as ozone or oxygen.

The reaction by which the rubber is made is a rapid and exothermic one. It is conducted at very low temperatures because this gives a product of higher molecular weight. In general, isobutylene containing a few % of isoprene, together with methyl chloride diluent to aid in control of the reaction, is cooled to approximately −150° F. and treated under conditions of intense agitation with a dilute solution of anhydrous aluminum chloride in methyl chloride. Under these conditions polymer is formed almost instantly in particles of very small size. These particles can be handled as a non-viscous cold slurry which is removed from the reactor by continuous flow through a short length of pipe.

Isobutylene mixed with isoprene and methyl chloride together with dilute recycle is fed to a reactor continuously. Aluminum chloride dissolved in pure methyl chloride is introduced as catalyst. These materials displace a corresponding volume of equilibrium feed-polymer mixture into a vessel containing agitated hot water which is referred to as a flash tank. The reactor, incidentally, is jacketed with boiling ethylene so that its contents are kept at a low temperature at all times. Methyl chloride and unreacted components are separated from the rubber in a flash tank and are taken overhead for recovery. The gases are compressed, dried over activated alumina, further compressed, and distilled. Normal butenes and bottoms fractions are purged before returning the feed to recycle. A small amount of pure methyl chloride is taken overhead for catalyst preparation.

Going back to the flash tank, rubber is recovered as a slurry of rice-like particles in hot water. The latter with its complement of slurry is pumped continuously to a vibrating screen or Oliver filter where it is separated as wet crumb, passed through a tunnel drier, extruded, hot milled, cooled, and packaged.

This completes the story of the chemical composition of butyl and the process used for its manufacture. Much more remains to be established about the best way to use butyl rubber for its ultimate applications. We are working on this in our research laboratories and are making progress. Meanwhile it is hoped that information of value will be developed in the period which follows.

Questions and Answers

Q. What are the optimum and the maximum safe temperatures for hot mixing butyl compounds?

A. Thomas. The temperatures employed in hot mixing butyl compounds vary somewhat, depending upon the filler used, but in general are within the range of 350 to 400° F. In no case should they be over 450° F. Carbon black compositions require 15 to 20 minutes for the mix; whereas Hi-Sil[2] or clays require only 10 to 12 minutes. In either case, the temperature of the final mix where accelerator is added should be kept down to about 200 to 220° F.

Q. What factors, besides heat, influence the reversion (depolymerization) of butyl rubber on extended aging?

A. The factors involved include the type of butyl used; the number and type of cross-links produced by vulcanization; the

[1]Rubber World, May, 1954, p. 203.
[2]Precipitated hydrated silica, Columbia-Southern Chemical Corp., Pittsburgh, Pa.

presence of chemical agents such as oxygen, ozone or hydrogen sulfide; the presence of ultra-violet light, X-rays, gamma rays, etc. together with other conditions which might be involved such as tension or flexing of the rubber during service. The best simple answer is to avoid the use of too much sulfur and accelerator in the vulcanizate.

Q. Can or should butyl rubber compounds be reinforced with high styrene resins?

A. On the basis of limited experience, it appears that true reinforcement of butyl with high styrene resins is not obtained although there is an increase in hardness with sacrifice in elasticity.

Q. Has butyl rubber ever been produced commercially as a synthetic latex or as a water dispersed suspension? If so, what products have been made and by what methods?

A. U. S. Rubber produces an aqueous dispersion of butyl rubber known as Dispersite, which has a high solids content and a high viscosity. It is believed to be made by inversion, adding water to butyl containing a minimum of filler with considerable ammonia and casein. It is used in adhesives.

During the war Pioneer Rubber & Latex Co. produced a water dispersion of butyl, under government contract, for an undisclosed use. At present Esso Research & Engineering is preparing butyl latex on an experimental basis by a different technique which looks very promising, particularly in tire cord dipping. It is hoped that this latex will soon be brought to a commercial stage of development.

Q. What is being done to improve curing times of butyl rubber?

A. Improvement in curing times for butyl rubber is being sought by (1) research on vulcanization at high temperatures, (2) development of better compounding techniques, (3) investigation of new curing systems, and (4) modification of the present types of polymers.

R. M. Thomas

Q. What property in the butyl rubber structure is responsible for its good heat aging?

A. No one property is responsible for the good heat aging of buytl. Absence of excess double bonds, presence of a sufficient number of cross-links, and low permeability, particularly to oxygen, are important factors.

Q. What effect would an increase in Banbury rotor speed (from 20 to 30 rpm.'s) have on the processing of butyl compounds?

A. An increase in Banbury rotor speed would result in faster and hotter mixing with improved dispersion. Temperature control in mixing is aided by starting at speeds up to 40 rpm. and then reducing the speed.

Butyl Rubber in Mechanical Goods

By William H. King

Acushnet Process Co.

Butyl rubber, a general-purpose synthetic elastomer, possesses a low degree of chemical unsaturation and offers many outstanding properties which make it of interest in the field of mechanical molded goods. The outstanding properties exhibited by this copolymer follow:

LOW PRICE. Butyl is one of the lowest priced elastomers available to the rubber industry today.

LOW GAS PERMEABILITY. Butyl offers excellent resistance to the diffusion of gases.

GOOD HEAT RESISTANCE. In order properly to evaluate butyl rubber compounds on a laboratory basis, it was necessary to increase aging temperatures from 158 to 212° F. and even 250° F.

GOOD WEATHER RESISTANCE. Oxygen and ozone have long been arch enemies of natural rubber and some synthetic elastomers. Butyl rubber, because of its low degree of chemical unsaturation, offers good resistance to the deteriorating effects of both of these gases.

GOOD FLEX RESISTANCE. The flex life of butyl rubber compares very favorably with that of natural rubber in ordinary applications, but is superior in certain critical applications.

GOOD CHEMICAL RESISTANCE. Butyl rubber offers good resistance to most acids, alkalies, and salt solutions. It also exhibits the characteristic of low water absorption.

GOOD ANIMAL AND VEGETABLE OIL RESISTANCE. Butyl rubber is superior to natural rubber or GR-S type rubbers in resistance to animal and vegetable oils.

GOOD TEAR RESISTANCE. Butyl rubber is similar to natural rubber in this respect. Tear resistance is improved by reinforcing pigments.

GOOD ELECTRICAL PROPERTIES. Butyl rubber is a saturated polymer free from electrolytes. Good electrical properties are retained even after immersion in boiling water.

GOOD BANBURY MIXING CHARACTERISTICS. Butyl rubber does not require breakdown. Pigments are added immediately; good dispersion results, and batches are relatively safe processing.

GOOD MOLDING CHARACTERISTICS. Butyl rubber stocks flow and knit well and, after cure, exhibit good hot tear properties which facilitate stripping from the mold in many instances.

GOOD PHYSICAL PROPERTIES. Pure gum butyl rubber compounds exhibit good physical properties similar to natural rubber and neoprene. Very low loadings of reinforcing blacks result in highest tensile properties. Colored stocks can now be compounded which will offer physical properties similar in many respects to carbon black reinforced compounds.

GOOD NON-STAIN PROPERTIES. Enjay Co. is now marketing five grades of nonstaining butyl rubber.

Applications

From this impressive list of desirable properties, it is little wonder that this copolymer is being used for such applications as bellows, boots, bumpers, conveyor belts, diaphragms, gaskets, grommets, hose, inner tubes, insulation, O-rings, shims, stoppers, tank linings, tubes, vibration dampeners, and weatherstrips. It is also worthy of mention that combinations of these desirable properties of butyl rubber can be had in the same stock without sacrificing other desirable properties. In other words, butyl rubber offers extraordinary properties as plus values to the compounder in the field of mechanical molded goods.

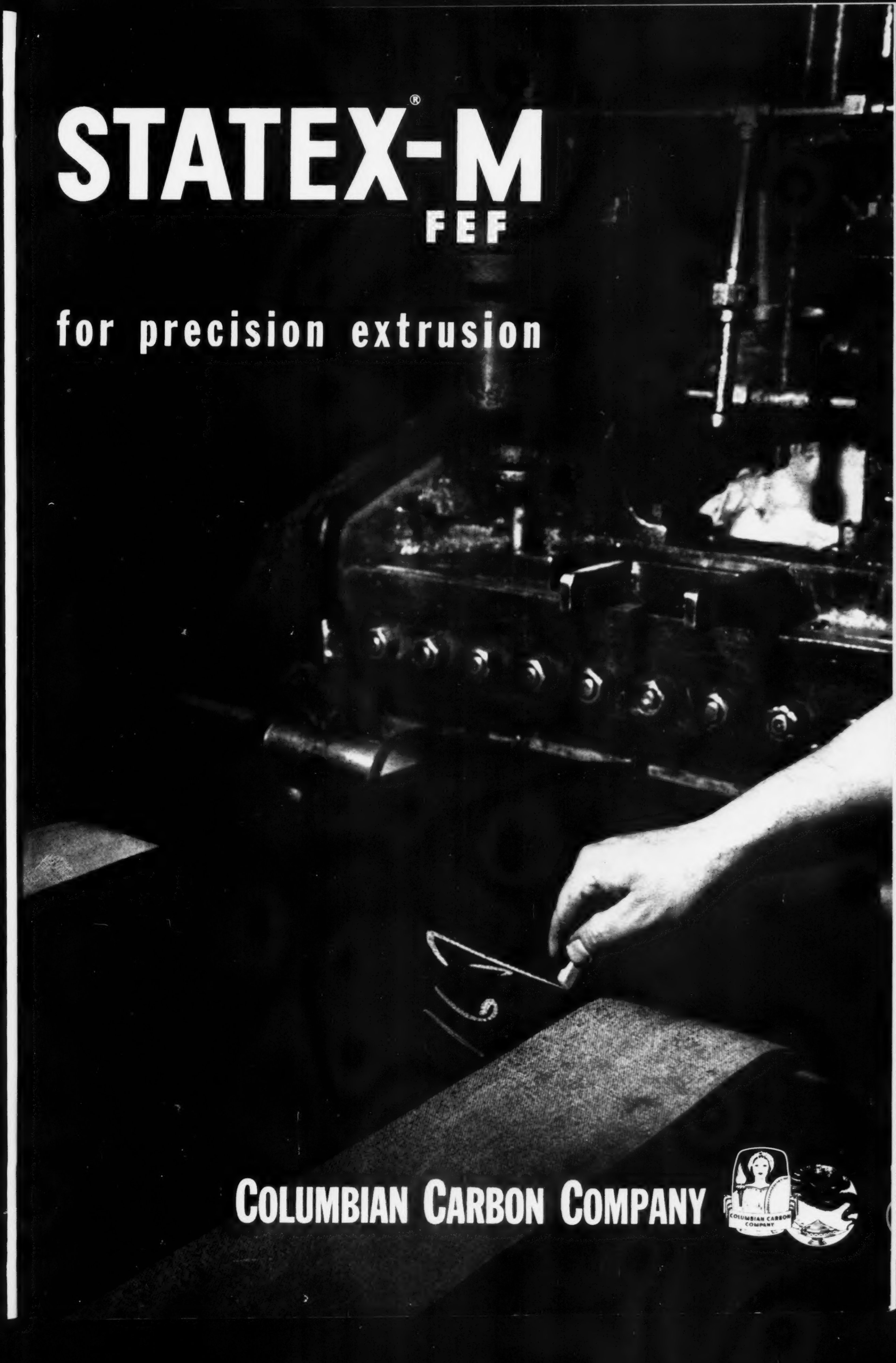
One problem that has been confronting the rubber industry for years is the necessity of improving products exposed to atmospheric conditions, that is, black or colored products made from general-purpose elastomers. In most instances these products must not only be weather resistant, but they must also be flex resistant or heat resistant or cold resistant or nonstaining. Specifying this additional requirement presents problems in many instances if your base polymer is not butyl rubber.

Aging Properties

To illustrate the good aging properties of butyl rubber, I have here an olive-drab butyl rubber gas mask that was cured in April, 1941. Since that time this mask has been on our aging board which is on the roof of our plant in New Bedford, Mass. Similar masks, when tested for physical properties in 1941, had a Shore A durometer hardness of 45, a tensile strength of 2500 psi., and an elongation of 900%. This mask, after aging for 14 years on the roof of our plant, was tested recently, and the Shore A durometer hardness was found to be 42, the tensile strength was 2120 psi., and the elongation was 700%. In addition to having good retention of physical properties, this butyl rubber mask is free of the usual checking and cracking so characteristic of parts made from other general-purpose elastomers when subjected to this same test for much shorter periods of time.

Compatibility and Resilience

Two problems are presented, however, should one endeavor to take advantage of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the desirable properties exhibited by butyl rubber. One problem is that of its susceptibility to contamination by other materials such as natural rubber or other synthetic rubbers having a high degree of unsaturation. The slightest contamination results in a poor or non-curing stock. Even unsaturated compounding ingredients must be avoided. This problem is not insurmountable though, and, by adopting good housekeeping practices, it can be eliminated or, at least, kept to a very minimum.

The second problem is that of resilience. Butyl rubber products do not exhibit the usual snap so characteristic of natural rubber; thus there has been some sales resistance toward the acceptance of products made from it. This problem is not as serious today, however, and I think you will find, in many instances, your customer will be specifying butyl rubber in order to take advantage of its many outstanding properties when used in the manufacture of mechanical molded goods.

Questions and Answers

Q. What is the effect of adding neoprene (in compatible proportions) on the cure rate, processability, and properties of butyl rubber?

A. King. The addition of neoprene to butyl rubber in compatible proportions has been recommended as a means of minimizing the softening of butyl compounds exposed to extreme heat or steam service. Limited work conducted at Acushnet indicates the addition of 2½ to 5 parts of neoprene does not have any great influence on either cure rate or processability of the stocks evaluated to date. Our work is incomplete at this time, and the relative merits of this compounding technique are still under investigation.

Q. What is the optimum extrusion temperature for minimum swelling and shrinkage of butyl rubber extrusions?

A. Butyl, because of its inherent nerve, does not lend itself to smooth extrusions exhibiting minimum and maximum swelling characteristics, particularly in the pure gum state. Usually, the addition of 20 volumes of carbon black or 30 volumes of mineral fillers is required for good extrusion characteristics, and the addition of reclaim and small percentages of petrolatum and/or process oils facilitates this operation.

The optimum compound temperature for good extrusions will vary with each compound and extruder, and this temperature will have to be determined on each compound, we believe, on a trial and error basis. Normally, extrusions are carried out at temperatures varying from 200 to 270° F. We might also add that extrusion rates of butyl compounds differ from those of natural or GR-S type rubber. Butyl normally extrudes at a slower rate than these two rubbers.

Q. What is the shrinkage of butyl compounds during vulcanization?

A. Generally speaking, butyl compounds will exhibit slightly lower shrinkage during vulcanization than similar natural or GR-S type rubber compounds. As with natural and GR-S type rubbers, the shrinkage will be influenced by the dimensions and geometry of the part as well as the stock preparation, compounding ingredients, and

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time and temperature of cure involved.

Q. What are the general recommendations for compounding and processing butyl rubber as compared with GR-S type rubbers?

A. Butyl rubber is vulcanized in much the same manner as GR-S type rubber in that it requires sulfur, an accelerator, and zinc oxide. The sulfur level in butyl is usually 1.5 to 2.5 parts per 100 parts of polymer, with 2.0 parts of sulfur being the general practice. This sulfur level can be a combination of elemental sulfur and an organic sulfide marketed under the trade name of "Sulfasan R,"[3] in equal proportions. This practice will eliminate objectionable sulfur bloom in the vulcanized stock.

Owing to the limited amount of unsaturation in butyl, there are fewer locations for potential cross-linkage and more active accelerators and higher temperatures are required to obtain desirable vulcanizates in reasonable cure times. Primary accelerators in concentrations of 1-2 parts per 100 parts of polymer are usually thiuram sulfide or dithiocarbamate types. Secondary accelerators in concentrations of 0.25- to 1.0 part per 100 parts of polymer are used to increase cure rate and can be selected from the thiazole, guanidine, or aldehydeamine types.

Unlike GR-S type vulcanizates, Butyl vulcanizates exhibit good physical properties without fillers or reinforcing agents. The addition of carbon black does not improve the tensile strength of butyl rubber. However, it does increase modulus and tear resistance, with channel and furnace blacks being more effective. Similar reinforcement can be obtained in colored stocks by the addition of calcium carbonate, clay, hydrated silica, titanium dioxide, and zinc oxide. Colored butyl stocks have a tendency to stick to mill rolls, and, if this is found to be a problem, the addition of 1-5 parts of BXDC (butoxyethyldiglycol carbonate) will facilitate handling.

Plasticizers for butyl must be saturated materials such as hydrocarbon oils, aromatic esters, and metal salts of fatty acids; usually 2-5 parts are adequate for good processing characteristics. For applications involving good low-temperature flexibility, 10 to 20 parts of an ester-type plasticizer are recommended.

Butyl can be processed on standard rubber equipment according to conventional methods.

Q. Under certain conditions, a plied-up sheet which looks very good on the calender will develop large blisters between plies after standing for several days. Is this condition caused by trapped air or some other reason?

A. These blisters could be trapped air and also could be caused by lack of proper pressure contact during the calendering operation. This blister problem is more acute with butyl, and extra caution should be exercised in such processing operations.

Q. What is the weather resistance of butyl compared with neoprene, Paracril,[4] etc.?

A. Assuming that all polymers were compounded for the ultimate in weather resistance, we believe silicone rubber, Hypalon,[5] Hycar PA-21,[6] Poly-FBA,[7] neoprene, and butyl could all offer good weather aging characteristics superior to those of natural, GR-S, and nitrile type rubbers. The selection of any of the above polymers for a weather resistant application would be dependent primarily on the other requirements that the application must fulfill.

Q. Will the addition of low percentages of butyl rubber to a GR-S type rubber compound improve the ozone resistance of the latter?

A. While the addition of low percentages of butyl rubber might improve the ozone resistance of a compound, we think that any improvement would be very slight. We question this compounding technique and think a better approach might be the addition of antiozidants and wax or, possibly, blending with brominated butyl rubber.

Q. In Banbury mixing of butyl compounds, give a typical mixing cycle including total mixing time and the temperatures which could be expected during this cycle.

A. We are endeavoring to mix our butyl batches at optimum temperatures consistent with practical procedures and normally start our Banbury mixing cycle on butyl rubber compounds at temperatures of about 150° F. maximum. The circulating water in the Banbury jacket is then turned off and the sequence of operations would be as follows: (1) Add butyl and one-half of filler and zinc oxide—seven minutes. (2) Add balance of filler, accelerators and processing aids—five minutes. (3) Add oils or plasticizers—three minutes. (4) Drop batch and add curative on mill. Circulating water is turned on again during the mixing cycle when the temperature reaches 235° F. We endeavor to have the drop temperature of our butyl batches approximately 235 to 250° F. Sulfur is added on the drop mill, and stock is cut and blended—this operation takes approximately four minutes.

(To be continued)

[3]Monsanto Chemical Co., Rubber Chemicals Department, Akron, O.

[4]Nitrile rubber, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

[5]Chlorosulfonated polyethylene, E. I. du Pont de Nemours & Co., Inc., elastomers division, Wilmington, Del.

[6]Acrylic rubber, B. F. Goodrich Chemical Co., Cleveland, O.

[7]Fluorocarbon polymer, Minnesota Mining & Mfg. Co., St. Paul, Minn.

William R. Collings, president, Dow Corning Corp., accepting the 1955 Chemical Engineering Achievement Award plaque at the Bellevue-Stratford Hotel, Philadelphia, December 7. Left to right: Donald C. McGraw, McGraw-Hill Publishing Co.; Sydney D. Kirkpatrick; Dr. Collings; Gen. John E. Hull; and Leland I. Doan

Dow Corning Wins Chemical Engineering Achievement Award for 1955; for Pioneering in Silicones

Dow Corning Corp., Midland, Mich., was presented with the Chemical Engineering Achievement Award for 1955 for its accomplishments in the field of silicones, during a ceremonial dinner at the Bellevue-Stratford Hotel, Philadelphia, Pa., December 7. This biennial award, a bronze plaque, has been sponsored by the publication *Chemical Engineering* since 1933.

The Dow company was selected by an 84-member committee consisting of heads of university or college engineering schools approved by the American Institute of Chemical Engineers, with Walter G. Whitman, Massachusetts Institute of Technology, as its chairman.

Accepting the plaque for Dow Corning was William R. Collings, president of the firm. Other speakers were Sidney D. Kirkpatrick, editorial director of *Chemical Engineering* and *Chemical Week*; Professor Whitman, representing the award committee; and John E. Hull, Gen. U. S. Army (Ret.) and president of the Manufacturing Chemists' Association, who delivered the keynote address.

In accepting the award, Dr. Collings emphasized that the achievement was the result of a group effort: by early silicone research scientists, by Dow Corning personnel, and by "the hundreds of engineers and other technical people who are employed by our customers and whose curiosity and desire to improve products of many kinds, were so essential to our success."

He also paid tribute to industrial and technical magazine editors throughout the country for their dissemination of the facts about silicones, in essence, a whole new grouping of diverse materials. The producer of new products, especially a new family of products, faces a difficult task in educating both technical men and the public, he said.

General Hull congratulated the 12-year-old company for its rapid success in the chemical industry.

"Dow Corning, a war-baby that started out with unspectacular sales of $15,000 a month, is now rolling along at a very respectable two - million - dollar - a - month clip," he said.

Terming the development of silicones "spectacular," he declared that the creation of this completely new class of materials from one of the commonest materials of the earth, sand, had provided new wealth, new jobs, and new benefits to almost every phase of American economic life.

He traced Dow Corning's contributions to the development of silicones, calling them a "well-organized, well-planned, inspired research-by-teamwork, so different from the Eureopean pattern where lingering caste concepts still tend to put the main glory and responsibility on one man."

Dr. Kirkpatrick, toastmaster for the occasion, recalled his early contacts with personalities in the silicone industry and how he had watched silicones grow "from one or two laboratory curiosities to over 200 products used by every industry and benefiting every phase of our daily lives."

Among the guests present were Shailer L. Bass, vice president of Dow Corning; Leland I. Doan, president, Dow Chemical Co.; Earl W. Bennett, board chairman, Dow Chemical; Edgar C. Britton, director of Dow Chemical's Edgar C. Britton Research Laboratory; Carl A. Gerstacker, treasurer, Dow Chemical; Amory Houghton, board chairman, Corning Glass Works; E. C. Sullivan, board vice chairman, Corning Glass; and Charles D. LaFollette, vice president and treasurer, Corning Glass. All are members of Dow Corning's board of directors.

The award dinner coincided with the twenty-fifth Exposition of the Chemical Industries in Philadelphia, December 5-9.

This award was last given to Carbide & Carbon Chemicals Co. for its commercial production of aromatic chemicals from coal by high-pressure hydrogenation. Carbide & Carbon is the only two-time winner, having previously been chosen in 1933, for its development of a synthetic organic chemical industry based on the hydrocarbons of petroleum and natural gas.

Advanced Boston Course

The Boston Rubber Group will sponsor a course in advanced rubber technology to be given at Northeastern University, Boston, Mass., beginning February 1 and extending for 16 weeks. Lectures will be given by B. B. S. T. Boonstra, Godfrey L. Cabot, Inc., Boston.

The nature of the course dictates that applicants have at least a Bachelor degree in chemistry or chemical engineering, or its equivalent in technical training and experience, the Group has announced.

Although applications were to have been submitted before January 10, additional applications may be considered after this date if the course's quota of students has not been filled. Interest in the course, however, has been heavy.

Further information and applications may be obtained from Alan W. Bryant, Education Committee, Boston Rubber Group, c/o Columbian Carbon Co., 803 B Park Square Bldg., Boston 16, Mass.

Nominations Solicited for Rubber Division 1956 Goodyear Medalist

Members of the Division of Rubber Chemistry, American Chemical Society, are invited to propose names for nomination by the Charles Goodyear Medal Committee for the purpose of electing a medalist for 1956 at the spring meeting of the Division to be held in Cleveland, O., May 16-18. Any member who wishes to propose a name should obtain from A. M. Neal, Division secretary, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., an outline suggesting the form in which such proposal should be made. The proposal in proper form should be mailed in time to reach Dr. Neal not later than March 26.

The Charles Goodyear Medal Award of the Rubber Division was instituted in 1939 to commemorate the 100th anniversary of the invention of the vulcanization of rubber and according to the Division by-laws "may be awarded annually to a person who has made a valuable contribution to the science or technology of rubber or related subjects." The award is not restricted to persons residing in the United States.

Previous recipients of the Charles Goodyear Medal, the year in which the medal was presented to them, and the reason for their election and the subject of their lecture, if any, are given below:

1941. David Spence. One of the pioneers in the field of rubber chemistry and one who did much important early work. No lecture given.

1942. L. B. Sebrell. Noted for research on antioxidants and accelerators. "The Second Mile," published in *Industrial and Engineering Chemistry*, 35, 736 (1943); *Rubber Chemistry and Technology*, 16, 713 (1943); India RUBBER WORLD, 108, 351, 451, 561 (1943).

1944. W. L. Semon. Pioneer in synthetic rubber research. "Research Leading to Commercial Butodiene Synthetic Rubber." *Chemical and Engineering News*, 24 2900 (1946); India RUBBER WORLD, 115, 364 (1946).

1946. Ira Williams. Work with neoprene and for overall accomplishments. "Vulcanization of Rubber with Sulfur." *Ind. Eng. Chem.*, 39, 901 (1947); *Rubber Chem. Tech.* 21, 1 (1948).

1948. George Oenslager. Honored for his discovery of organic accelerators in connection with research on the vulcanization of rubber. No lecture given.

1949. H. L. Fisher. Overall accomplishments in rubber research and with special reference to the reactions of sulfuric acid and related materials on rubber and research on non-sulfur vulcanization. "Rubber Research and the Need of a Rubber Research Institute in the United States."

1950. C. C. Davis. Development of the oxygen bomb for accelerated aging of rubber, editor of *Rubber Chemistry and Technology*, co-editor of "The Chemistry and Technology of Rubber," and work for *Chemical Abstracts*, are among the accomplishments of this medalist. "Some of the Real Pioneers of the Rubber Industry." India RUBBER WORLD, 123, 433 (1951).

1951. W. C. Geer. Developed the oven aging test, deicer for airplanes, and long an advocate of the value of rubber research. "Strategy in Rubber Research." *Ind. Eng. Chem.*, 43, 2436 (1951).

1952. H. E. Simmons. One of the early and best known teachers of rubber chemistry and a source on inspirational guidance for young men in the industry. "Out of the Past."

1953. J. T. Blake. Honored for his research on the oxidation and vulcanization of rubber and many other accomplishments. Co-editor of "The Chemistry and Technology of Rubber." Title of lecture was "The Future of Rubber." *Chem. Eng. News*, 31, 4290 (1953); India RUBBER WORLD, 129, 222 (1953).

1954. G. S. Whitby. Noted for research on both natural and synthetic rubbers, vulcanization, accelerators, etc. "Reflections on Rubber Research." *Ind. Eng. Chem.*, 47,806 (1955).

1955. R. P. Dinsmore. Honored for his many accomplishments including rayon cord tire, rubber hydrochloride film, and polyisocyanate rubber. "Specifications for a Rubber Chemist."

John Ball, chairman of the Award Committee, suggests that members in considering proposals for nominations for the 1956 Goodyear Medal Award, examine the following list of fields of chemistry and technology which have not yet been fully recognized by a Goodyear Medal Award: (1) discovery of polychloroprenes; (2) copolymers of isobutylene and dienes (butyl rubber); (3) reinforcement of rubbers; (4) the physics of rubber; (5) polysulfide rubbers; (6) silicone rubbers; (7) LTP GR-S and oil-extended type GR-S rubbers; (8) polyacrylate rubbers; (9) physical testing; (10) new processing equipment; (11) devulcanization of rubber.

Washington Group Hears Sears Talk on Liberia

W. J. Sears, vice president of The Rubber Manufacturers Association, Inc., recently returned from the twelfth meeting of the International Rubber Study Group held in Monrovia, Liberia, spoke on his impressions of the West African nation before 55 members and guests of the Washington Rubber Group at their meeting at Pepco Auditorium, Washington, D. C., on November 17.

Mr. Sears stressed the beneficial influence that American companies, particularly The Firestone Tire & Rubber Co., are having on the Liberian economy. Firestone first started exploiting Liberia's rubber resources in 1926 when it obtained a 99-year lease on 1,000,000 acres of land, of which 90,000 acres of rubber plantations have so far been developed.

Another American rubber company, The B. F. Goodrich Co., obtained an 88-year lease on 600,000 acres of land in 1954, of which 350 acres of rubber trees have so far been planted. Recently, Mr. Sears said, the Liberian Mining Co., affiliated with Republic Steel Corp., has developed what is reputed to be the richest iron ore mine in the world at Bomi Hills, which is expected to export 1,500,000 pounds of 70%-iron ore a year.

About 78,000 of Firestone's 90,000 planted acres are at the Harbel plantation, the largest single plantation in the world operating as an integrated unit, according to Mr. Sears. Liquid latex, the principal product, is collected by the separate subdivisions of the plantation and brought by tank truck into the single central processing factory.

It was pointed out that the average yield of all the Firestone rubber trees during 1954 was a little more than 1,000 pounds per acre, probably the highest overall plantation yield in the world. The newer clonal types of trees are expected to increase this average yield, since about 20% of the standing trees are of the old seedling variety.

Mr. Sears was especially impressed by the Firestone method of replanting, unlike anything he has observed in the Far East. A stand of old seedling rubber trees is attacked with a type of bulldozer, uprooting the trees. Then a ditch-digging machine cultivates a narrow path through the fallen trees. The young high-yielding clonal trees are planted in the pathway. The fallen trees are not removed, but disintegrate within a period of two years through tropical decay.

Society of Rheology Holds Annual Meeting

The annual meeting of the Society of Rheology was held at the Henry Hudson Hotel, New York, N. Y., November 2-4. More than 120 members and guests attended the three-day technical sessions, which included discussions of such subjects as developments in the study of the viscoelastic properties of high-polymers and a method for the determination of structure in dispersions by viscometry.

Among the topics dealt with under viscoelastic properties were the use of stress-strain curves to characterize the properties of polyisobutylene; a test method for determining the dynamic mechanical properties of plastics, particularly the behavior of polymethyl methacrylate; a method of determining the dynamic bulk modulus, with data taken over a wide frequency range on several rubber-sulfur mixtures; and the similarity between the behavior of melts and polymer solutions as shown through data on molten polyethylene.

A description of a vibratory gyro mass flowmeter, together with a method for the determination of structure in dispersions by viscometry, was included in the final technical session of the meeting. Other topics included the gradient dependence of intrinsic viscosity in reference to the determination of the flow inside the space occupied by the macromolecule; and fracture in viscoelastic liquids under sheer stress with data taken on the extrusion of melted plastics through capillaries and slits.

Carbon Black Economics Subject of Drogin Talk

"Carbon Black Fundamentals" was the subject of a talk given by I. Drogin, vice president of technical sales, United Carbon Co., Inc., Charleston, W. Va., before the Eau Claire Technical Society, Eau Claire, Wis., last October.

The carbon black industry might not have survived if a low-price rubber polymer requiring reinforcing pigment had not been developed, or if a pigment as good and as cheap as carbon black had been found, Dr. Drogin declared.

Despite the existence of such high-cost specialty rubbers as Hypalon and urethane which do not require reinforcement, and despite the currently available fine-particle silicas, carbon black still remains the best and cheapest pigment for bolstering the strength of rubber, he said.

Up to a decade ago, 97% of the world's carbon black was U. S. produced, but since World War II, carbon black plants have sprung up in Canada, England, Germany, and in eastern Europe. In this country eight companies make carbon black in 52 plants which are located in Louisiana, Texas, Arkansas, California, Kansas, and New Mexico.

Two years ago nearly 301,000 million cubic feet of gas at an average value of 5.87¢ per thousand and 187,207,000 gallons of liquid hydrocarbon at an average value of 7.69¢ per gallon were used for carbon black manufacture in the United States, the United Carbon official stated.

The yield from this gas averaged 1.92 pounds per thousand cubic feet for the channel process, 7.18 pounds for the furnace process, and the yield from the liquid hydrocarbons in the furnace process averaged 3.68 pounds per gallon.

AIIE Automation Confab

The Cleveland Chapter of the American Institute of Industrial Engineers, Inc., will hold its Fifth Annual Spring Conference, March 15 and 16, on the subject of "Automatic Control, Industrial Engineering at the Crossroads." Site of the conference and accompanying exhibit has not yet been disclosed.

Tentatively included in the list of guest speakers are Walter P. Reuther, vice president, AFL-CIO, who will discuss "Is Automatic Control Bringing a Second Industrial Revolution?", and John T. Diebold, president, John Diebold & Associates, Inc., New York, N. Y., who will talk on "Introduction to Language and Technique of Automatic Control."

Other subjects to be dealt with include development and manufacture of control equipment, design of automatically controlled machines, new management problems with automatic control, electronic data processing, and the shortage of technically educated personnel.

Further information may be obtained from W. S. Ritchie, American Institute of Industrial Engineers, Room No. 330, Cuyahoga Savings Bldg., 2123 E. Ninth St., Cleveland 15, O.

Akron Group, January 27, Panel Meeting

The Akron Rubber Group meeting of January 27, at the Sheraton-Mayflower Hotel, Akron, O., will feature a panel discussion on the subject of "Rubber Meets the Challenge of Modern Transportation."

The possible future rubber requirements of the auto industry, in the broadest sense, will be outlined by W. J. Simpson, of Chrysler. The challenging specifications for rubber parts of the aircraft of tomorrow will be described by E. R. Bartholomew, of the Wright Patterson Air Force base. James D. D'Ianni, Goodyear Tire & Rubber Co., will act as moderator at the discussion.

The following panel of experts will describe what can be achieved with the various polymers to meet these challenges and will also point out the limitations of the polymers for meeting the forward needs of the aircraft and the automotive industry: J. J. Allen, Firestone Tire & Rubber Co., natural and GR-S type rubbers; B. M. G. Zwicker, B. F. Goodrich Chemical Co., nitrile rubbers; H. C. Evans, Enjay Co., Inc., butyl rubber; and R. Malcomson, E. I. du Pont de Nemours & Co., Inc., neoprene and Hypalon. Other specialty rubbers, such as the silicones, fluorocarbon rubbers, acrylic rubbers, and polyurethane rubbers, will also be discussed by the panel.

Otto Graham, of the Cleveland Browns, will be the dinner speaker.

Machine Design Show

A conference to study industry's problems in design engineering will be sponsored by the machine design division of the American Society of Mechanical Engineers at Convention Hall, Philadelphia, Pa., May 14-17. Held there at the same time will be the First Design Engineering Show, produced by Clapp & Poliak.

According to Robert M. Conklin, chief, mechanical engineering division, Battelle Memorial Institute, Columbus, O., and chairman of the ASME machine design division, "There is an urgent need for a national conference to consider current problems in design engineering, including the human relations of design engineering."

Four editors of publications in the engineering design field have been named as an auxiliary papers committee to draft a program for the four-day meeting. They are Colin Carmichael, *Machine Design*; T. C. DuMond, *Materials and Methods*; George F. Nordenholt, *Product Engineering*; and Frank J. Oliver, *Electrical Manufacturing.*

Tentatively scheduled for discussion are such subjects as cost reduction in product design, training methods for design personnel, selection of engineering materials, methods for effecting miniaturization, and inventions and patents.

About 150 companies will exhibit components and materials which go into the making of end-products during the Design Engineering Show.

Advance registration cards for the exhibit may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. Information concerning the conference may be obtained from Clapp & Poliak or from the ASME, 29 W. 39th St., New York 18, N. Y.

McClure Honored by AIC

Harry B. McClure, president, Carbide & Carbon Chemicals Co., New York, N. Y., was given honorary membership in the American Institute of Chemists at a dinner-meeting of the group held at the Hotel Commodore, New York, January 12.

Ray P. Dinsmore, The Goodyear Tire & Rubber Co., and national president of AIC, presented the honorary membership. Toastmaster for the occasion was Sidney D. Kirkpatrick, McGraw-Hill Publishing Co. Lawrence H. Flett, consultant to National Aniline, reviewed the Carbide & Carbon executive's career.

Speaking on "Benefitting from Research Results," Mr. McClure asserted that research discoveries may not benefit mankind unless someone devotes time and energy to develop the discovery. Thousands of chemicals are being synthesized each year, he said, but many of these discoveries may not realize their full promise unless research is carried out and the results become available to the public.

Mr. McClure began his career as a research fellow with Mellon Institute. He joined Carbide & Carbon in 1936, rising successively, to manager of the company's fine chemicals division, vice president, executive vice president and then president in 1954. In 1950 he was honored by the Commercial Chemical Development Association for his services to the chemical industry.

Groups Fete Noel

Detroit Festivities

The Detroit Rubber & Plastics Group held its annual Christmas party at the Sheraton-Cadillac Hotel, Detroit, Mich., December 9, with 941 members and guests in attendance. Some 200 door prizes were distributed.

R. C. Chilton, Permalastic Products Co., arranged the entertainment program, which featured Michael MacDougall, "The Card Detective," who demonstrated how to be an expert card cheater.

Newly elected officers of the Group for 1956 were announced as follows: chairman, H. W. Hoerauf, United States Rubber Co.; vice chairman, H. F. Jacober, Baldwin Rubber Co.; secretary, E. J. Kvet, Jr., Detroit Arsenal; treasurer, W. F. Miller, Yale Rubber Mfg. Co.; membership chairman, W. A. Wiard, Dow Corning Corp.

Also educational chairman, R. W. Malcolmson, E. I. du Pont de Nemours & Co., Inc.; publicity chairman, W. D. Wilson, R. T. Vanderbilt Co.; entertainment chairman, Mr. Chilton; and program chairman, S. R. Schaffer, U. S. Rubber.

The next meeting of the Group is sched-

uled for February 3 at the Detroit Leland Hotel at which Calvin Yoran, Brown Rubber Co., will talk on "Vinyl Foam" at the technical session, and E. B. Newton, Goodrich Research Center, will discuss "The New Synthetic Natural Rubber" at the dinner session.

Boston Celebration

The Boston Rubber Group held its annual Christmas party at the Hotel Somerset, Boston, Mass., December 16, with 625 members in attendance. The agenda for the evening consisted of a cocktail hour, dinner, a short business session, the distribution of door prizes, and entertainment.

Retiring Chairman Edwin D. Covell, Stedfast Rubber Co., presided over the business meeting. Ralph B. Huber, Ralph B. Huber, Inc., teller's committee chairman, introduced the Group's newly elected officers for 1956.

They are Arthur I. Ross, American Biltrite Rubber Co., vice chairman and chairman-elect; Roger Steller, B. F. Goodrich Chemical Co., secretary-treasurer; and James J. Breen, Barrett & Breen Co., and William H. King, Acushnet Process Co., members of the executive committee. James E. Williamson, Tyer Rubber Co., who automatically succeeded to the position of chairman, was introduced as well.

SORG Dinner-Dance

The Southern Ohio Rubber Group held its annual Christmas party at the Miami Valley Golf Club, Dayton, O., with 249 members and guests in attendance. Eighty-six prizes were distributed, in addition to special gifts for the ladies present, and an orchestra provided dance music.

Under the chairmanship of I. L. Wolk, The Dayton Rubber Co., the arrangements committee consisted of J. E. Feldman, Inland Mfg. Division; Laurence H. Bruce, Naugatuck Chemical Division; Wm. H. Dietz, E. I. du Pont de Nemours & Co., Inc.; Louis J. Keyes, Dayton Rubber; Samuel J. Miller, The DuBois Co.; Edward Moorman, Dayton Rubber; Richard C. Waymire, Inland; and Norman Wissinger, Dayton Rubber.

Newly elected officers for 1956 were announced as follows: chairman-elect, Edward N. Cunningham, Precision Rubber Products Co.: secretary, Russell J. Hoskin, Inland; treasurer, L. Donald Neu, Premier Rubber Mfg. Co.; and directors, Harold Schweller, Inland, Robert Treue, Dayton Rubber, and Richard Logues, Columbian Carbon Co. James R. Wall, chairman-elect for 1955, was elevated to chairman for 1956.

New York Party

The New York Rubber Group held its annual Christmas party at the Henry Hudson Hotel, New York, N. Y., December 9, with 500 members in attendance. More than 110 door prizes were distributed after a full program of entertainment.

S. M. Martin, Jr., Thiokol Chemical Corp., outgoing Group chairman, introduced the newly elected officers and directors for 1956. They were G. H. Provost, United States Rubber Co., chairman; H. J. Due, St. Joseph Lead Co., vice chairman; M. E. Lerner, *Rubber Age*, secretary-treasurer; and R. E. McElroy, Harwick Standard Chemical Co., sergeant-at-arms.

Members of the executive committee, serving for three-year terms, follow: C. L. Ayers, Borne-Scrymse Co.; C. F. Hoover, Pequanoc Rubber Co.; M. A. Minnig, Witco Chemical Co.; and J. H. Fielding, Armstrong Rubber Co.

Record Chicago Gathering

With a record 1,020 members and guests in attendance, the Chicago Rubber Group held its annual Christmas party at the Morrison Hotel, Chicago, Ill., December 16. Gifts were distributed to the ladies present, and a program of entertainment and dancing followed the cocktail hour and dinner.

John F. Swart, Van Cleef Bros. Division of Johns-Manville, and John B. Porter, H. Muehlstein & Co., were chairman and vice chairman, respectively, of the committee in charge of arrangements. Other committee members included Maurice J. O'Connor, O'Connor & Co.; Fred G. Bastian, Van Cleef; Russell A. Kurtz, E. I. du Pont de Nemours & Co., Inc.; Allen V. Loos, Mystik Adhesive Products; and James B. Moore, Roth Rubber Co.

The committee expressed its appreciation to the more than 155 rubber manufacturers and chemical suppliers whose contributions made the party possible.

Ingmanson Joins RW Editorial Board

John H. Ingmanson, vice president of The Whitney Blake Co., and executive vice president of Koiled Kords, Inc., has joined the Editorial Advisory Board of RUBBER WORLD, as of January 1. Mr. Ingmanson replaces R. A. Schatzel, vice president of Rome Cable Corp., who has resigned from the Board after serving most helpfully since January, 1950.

The new Board member has been with Whitney Blake for the past 12 years. He had been employed in the research department of Bell Telephone Laboratories for some 15 years previously. Mr. Ingmanson is an active member of the American Chemical Society and its Division of Rubber Chemistry and also of the American Society for Testing Materials and Committee D-11 on Rubber of the latter organization. He will advise the editor of RUBBER WORLD in the field of wire and cable insulation.

John Ingmanson resides in Hamden, Conn., and is an ardent fisherman.

John H. Ingmanson

Canadian Foam Symposium

A symposium on "Machinery Used in the Manufacture of Flexible Foams" was presented at a joint meeting of the Wellington Waterloo Section and the Ontario Rubber Section, CIC, at the Kress Mineral Springs Hotel, Preston, Ont., Canada, November 8. Ninety members and guests attended.

Speakers and their subjects were F. Youngdahl, Mechanical Handling Systems, "Machinery for Latex Foam Rubber"; Boyd Hopkins, Girdler Corp., "Machinery for Vinyl Foam"; and Mr. Kittner, Mobay Chemical Co., "Production of Urethane Foam."

The speakers were introduced by Bruce Williams, Dunlop Canada, Ltd., and thanked by Ron Howey, Naugatuck Chemical Co. W. H. Bechtel, chairman of Ontario Section, presided.

Christmas Meeting

The Ontario Section held its annual Christmas party at the Collins Hotel, Dundas, Ont., December 13, with 104 members and guests present. H. F. Bethell, R. T. Vanderbilt Co., delivered a talk on recent developments in the rubber industry.

Mr. Bethell outlined events leading to a greater competition in the sale of polymers in the United States and also discussed the development of butyl dispersions, higher press cures, antiozidants, and the place of silicates in the pastel-color schemes apparent in the current market.

George Winspear, editor of the *Vanderbilt News,* followed this technical talk with a humorous one of his own.

The speakers were introduced by Rudy Berner, Boston Insulated Wire & Cable Co., and W. J. Nichol, Dunlop Canada, Ltd.

The Vanderbilt company was host at the cocktail hour preceding dinner. Several door prizes were given to lucky ticket holders.

Buffalo Hears Foam Talk

Jerome E. Burwell, manager of Airfoam compounding, The Goodyear Tire & Rubber Co., Akron, O., spoke on "Modern Flexible Foams—Their Manufacture and Uses" before 71 members and guests of the Buffalo Rubber Group at the Hotel Westbrook, Buffalo, N. Y., October 4.

Mr. Burwell described the various latices

(*Continued on page 570*)

NEWS of the MONTH

Washington Report and National News Summary

. . . The December report of the Special Commission for Rubber Research of the National Science Foundation recommended termination of the present $1 million per year rubber research program June 30, 1956, and a new and more basic program on molecular structure and composition of high polymers be worked out by June 30, 1957. No further need of government research on a substitute for natural rubber exists, but aid for the rapid commercialization of the new synthetic polyisoprene should be considered by the government "at its highest levels."

. . . The Commission recommends that the Akron Government Laboratories be offered for sale after June 30, 1956, unless the University of Akron accepts a lease, at a nominal fee, of the facility to run until June 30, 1957.

. . . The Rubber Producing Facilities Disposal Commission signed a contract with Goodrich-Gulf Chemicals, Inc., on December 20, for sale of the Institute, W. Va., GR-S copolymer plant for $11 million. Approval of this contract by the Attorney General and the Congress faces several hurdles including whether the sales price is high enough and whether the sale would put Goodrich-Gulf in a position to dominate the synthetic rubber industry.

. . . In its seventh annual report of the government's activities in rubber, the Commerce Department emphasized the continuing need of more synthetic rubber and revealed the mobilization planning of the Department for the rubber industry.

. . . Year-end reports of The Rubber Manufacturers Association, Inc., and industry executives pointed to the new production and sales records achieved by all branches of the industry in 1955. New rubber consumption in 1956 was estimated at 1,480,000 long tons by the RMA, of which up to 65% will be synthetic. Major expansions in production facilities for both synthetic rubber and rubber products are planned for 1956. Total sales volume of the industry in 1956 was estimated at between $5.75 and $6 billion. Non-tire product sales in excess of $2 billion in 1956 were predicted.

. . . Production of synthetic rubbers reached an all-time high of 91,249 long tons in November; while more than 11,000 long tons of the four principal synthetic rubbers were exported in September and October.

Washington Report

By ARTHUR J. KRAFT

New Basic Research, Possible Aid to Polyisoprene Production, Sale of Akron Laboratory, Recommended by NSF Rubber Research Commission

The Special Commission for Rubber Research of the National Science Foundation advised the government in December to put its money behind "a new and more basic" rubber research program to replace the decade-old synthetic rubber research activities slated to end next June.

The proposal was one of three made by an 11-member Commission of industrialists, scientists, and university presidents appointed last fall to help federal policymakers decide whether the recent withdrawal of the government from the operation of the synthetic rubber industry should be followed by its withdrawal from the related research program.

The Commission, headed by William H. Davis, a New York patent lawyer and former War Labor Board chairman, answered both "yes" and "no" to this question. The government, it said, should pull out and leave to industry those research activities directly related to producing or utilizing synthetic rubber. This suggestion means ending the $1 million a year University contracts program, most of which is closely tied, as it was designed to be, to the needs of the synthetic rubber producing industry.[1]

New Basic Research Needed

In its place the Commission suggested "a new and more basic program made up of research projects in the general area of molecular structure and arrangement, composition and properties of the high polymers, particularly elastomers, and the methods of preparing such materials." The Commission said the switch should be made after June 30, 1957. Those parts of the present program that deal in basic polymer research would be absorbed into the new program. The National Science Foundation, which now administers the contracts, should be given money to wind up the present program—comprising 11

[1] Rubber World, Oct., 1955, p. 90.

contract grants totaling nearly $1 million a year—within the coming fiscal year.

Akron Lab Sale—Aid Polyisoprene Production?

The Commission made its report to the National Science Foundation, which transmitted it to the White House. Its two other recommendations were:

(1) Sell the war-built government rubber laboratory and evaluation facilities at Akron through a negotiated bid sale similar to those conducted over the past two years for the rubber producing plants. Under the Commission's proposal the University of Akron, which now runs the "labs" on a cost-plus-fee contract from the government, would be given a crack at leasing them for one year, without any government subsidy. If the University accepts a lease on these terms, sale of the "labs" would be postponed until June 30, 1957. The year would serve as a trial period to give the University a chance to see whether it could run the "labs" without losing money. The University, of course, would be eligible to bid for the purchase of the "labs" along with any other bidders after the year is over. If the University rejects a lease, the "labs" would be put on the block June 30, 1956.

(2) "The Commission feels impelled to recommend that the Government, at its highest levels, give immediate consideration to the following question: Does the national security require governmental action to foster the industrial development of the new processes of synthesizing 'natural rubber?'" This recommendation was certainly the big surprise in the 50-page report turned in by the Commission. The Commission said it doesn't have the answer to this question. From the nature of its discussion of the subject, it would appear that by "highest levels" of government, the Commission apparently meant the cabinet-level National Security Council, which directly advises the President on policies affecting the nation's defenses.

The proposal that the government consider underwriting—and thus assuring—commercial development of the complete substitute for natural rubber stemmed from two considerations, each opposed to the other. For one, the Commission is firmly on record in its report for cutting off government aid of industrial research. On the other hand, the national defense requires that certain research go on. Foremost among those objectives of a defense-necessity character is freeing the military from reliance on natural rubber, the only acceptable material available today for heavy truck and airplane tires for the Army, Air Force, and Navy. As such, it is the prime reason for maintaining an expensive government natural rubber stockpile. Research to develop a complete substitute has long weighed heavily in government-financed synthetic rubber research. About half of the $1 million currently applied to the University contracts program is tied up in such research.

The importance of this objective to the Defense establishment, as the Commission duly noted, was stressed very strongly only last January by the rubber panel of the Materials Advisory Board, National Research Council-National Academy of Sciences, in an advisory report requested by the Defense Department on the future needs of the department for a rubber research and development program. The main difference is that the problem, at the time the MAB panel took it up, was one for research. Today, with three companies having announced a successful process of synthesizing "natural" rubber, it is primarily an industrial development problem.

Defense Department Research

The Commission found an easy answer to the other major rubber research needs of the Defense Department, as outlined by the MAB panel. These were finding synthetic rubber or rubber-like materials with properties meeting operational needs of present and future weapons systems and for high-speed aircraft tires.

"The Commission believes," its report said, "that research on such problems directed toward specificed end-products needed by the military agencies, whether called 'basic research' or 'applied research,' is most appropriately carried on through contracts placed by the Department of Defense with individuals or groups chosen by it, and the Commission knows of no good substitute for this direct action."

Polyisoprene Commercialization

The other problem area spotlighted by the MAB panel, of course, was research on "synthetic rubbers or rubber-like materials to replace natural rubber completely." The Commission gave special attention to this problem because, since the MAB report, production of a natural rubber substitute has become and, in the Commission's words, "is now an industrial development problem rather than a research problem."

While government-sponsored scientific research is no longer needed to bring about a natural rubber substitute, there was some question in the Commission's mind as to whether the next step, commercial development, can be attained without some Government assistance.

"Economic conditions," the report said, "may provide an environment under which commercial development of the new processes for making natural rubber substitute will move forward without any governmental action. If not, such an environment can be created by appropriate governmental action which may be either legislative or executive and may take any one of a number of different forms."

The Commission drew a parallel between this situation and the question of how to launch a synthetic rubber industry which was "considered and debated extensively in the years preceding the war rubber crisis of 1941. When action was finally taken there was no alternative to the immediate creation of a government synthetic rubber industry. During the preceding years, however, it was the absence of a favorable economic environment, not the lack of scientific research data, which prevented the building up of a privately owned synthetic rubber industry."

The scientific and economic status of the recently developed synthetic "natural" rubber was reviewed by the Commission:

"The Commission is advised," the report said, "that subsequent to the preparation of the MAB report, the Goodrich, Firestone, and Goodyear companies have each succeeded independently in synthesizing material with composition and properties similar to natural rubber, using isoprene as raw material. Isoprene, like the butadiene needed for GR-S rubber and the isobutylene needed for GR-I rubber, can be made from petroleum in any necessary quantities, although much time will be required to complete the details of the industrial production methods, to integrate most economically any large new production of isoprene with other phases of the oil and petrochemical industries, and to build the new equipment needed. The initial estimates of production cost are within the range of recent prices of natural rubber."

"New and More Basic" Research

In urging a "new and more basic" approach to synthetic rubber research by the government, apart from the question of whether to assist in giving birth to the already developed isoprene synthetic "natural" rubber, the Commission presented this argument:

The Government should step up its support of basic scientific research all along the line, leaving applied research to industry or, where specific military needs are involved, to government contracts with private research agencies, including industry. In the field of polymeric materials, rubber-like materials and other elastomers of improved properties, this means finding "entirely new structural materials." The Commission said the "most effective way" of doing this "is to expand basic research on molecular structure and arrangement, composition, and properties, and methods of preparing such materials, all as they affect such special properties of matter. Such research is in a scientific area which lies at the interface of chemistry and physics. It is much broader than any single industry or any one of the specialized scientific disciplines.

"The Commission believes that explorations by basic research in this area are the best possible foundation both for new industries and for new military developments. Applied science and industrial research require more and better information in this broader area rather than continuation of the present program of mixed basic and applied research on synthetic rubber. Some of the sponsored projects within the present rubber research program being administered by the National Science Foundation seem to lie very near to her recommended new program, and some of the scientists now engaged in projects of a more applied character will undoubtedly wish to undertake researches in the more basic area. It is therefore clear that important human and scientific assets built up by the past government rubber research program could be utilized in the recommended program.

NSF Report Basis for White House Report?

The Commission's report now goes to a six-agency ad hoc committee, named by President Eisenhower to draw up a report to Congress covering the nation's future

supplies of and requirements for rubber and the needs—whatever they may be—of continuing government-supported research. This White House report is required by the same law which authorized the removal of the government from the production of synthetic rubber. The report must be submitted by April 29. New legislation will be required to set the government's programs in those areas which the Commission, at the Foundation's request, considered. These are whether and how to dispose of the Akron labs and whether and how to underwrite rubber research activities.

The recommendations of the Commission—a body of disinterested experts—will not necessarily be controlling in the decisions to be made by the Administration and the Congress. But they are bound to receive respectful attention, certainly at the level of the ad hoc committee. The National Science Foundation is one of the six agencies on that committee, and it has been delegated chief responsibility in gathering together the data and expert opinions needed to formulate the recommendations dealing with the research program that will go into the President's report to Congress. The Foundation, while it hasn't specifically said so, is virtually certain to rely heavily—and perhaps adopt in toto—the proposals made by the Special Commission it named to help in that task.

Institute Plant Contract to Goodrich-Gulf; Approval May Present Problems

The Rubber Disposal Commission last month announced that it had signed a contract to sell the long-idle Institute, W. Va., copolymer (GR-S) plant to Goodrich-Gulf Chemicals, Inc., for $11 million. The contract, signed December 20, climaxed nearly two months of frequently tense negotiations between the Commission and six bidders who sought to buy this last of the government's war-built GR-S plants.

Contract Approval Hurdles

The signed contract faces several hurdles before Institute may be considered safely in the hands of Goodrich-Gulf. For one, the Commission was required under Public Law 336 to submit the contract to the Attorney General. Mr. Brownell, in turn, is charged with the duty of determining whether the sale to Goodrich-Gulf "will best foster the development of a free, competitive synthetic rubber industry." His findings were to be included in a report which the Commission must submit to Congress by January 13. The report was in preparation as RUBBER WORLD went to press.

The second hurdle, of course, will be Congress itself. Under the law the contract must lie before each legislative chamber for 30 days. If in that time neither House nor Senate adopts a resolution disapproving the sale, the contract becomes final and effective. In this case the Institute plant would become the property of Goodrich-Gulf about mid- or late February. If the contract meets with a legislative veto, the plant will remain under government ownership unless Congress passes a new law setting up a new disposal mechanism.

Current odds favor approval (assuming the Attorney General supports the sale), but not before a fight from House and Senate Democrats. If past is prologue, the issues that appear likely to dominate in that fight are two: (1) Is $11 million a high enough price to reflect "full, fair value" of a plant that cost $18 million to build in 1942-43? (2) Will sale of such a large plant put Goodrich-Gulf in a position to dominate the synthetic rubber industry and, through control of supply and price, restrain expansion opportunities of rubber fabricating firms (particularly those thousands of small manufacturers that own no synthetic rubber plants) which compete in the sale of manufactured rubber goods with B. F. Goodrich?

$11-Million Price Adequate?

The question of whether the government is getting a fair return for this property does not, at this distance, appear likely to dominate the debate, and for several reasons. For one, others who bid for the plant—all experienced businessmen presumably exercising their best business judgment in evaluating the present worth of the plant—submitted bids far below $11 million.

For another, the Institute plant has been idle since September, 1953, for good reason. It is the least economical, least modernly equipped of any GR-S plant. To operate it profitably will require substantial investment by the buyer in new processing equipment and basic utilities. Moreover, while the plant is close to its market area, it is far removed from the main sources of its raw material, butadiene, which currently is in very tight supply and likely to remain so until new butadiene plants are built.

For these reasons Institute's 122,000 tons a year of RS capacity is misleading in terms of the amount of rubber that can be produced there under present conditions. It might be more realistic to consider Institute as a 40,000-ton plant for the present time. That is roughly the capacity of one of three equal-size units at Institute. Eventually, with new equipment and an easier supply of butadiene, the remaining capacity can be brought into play. But this project will take time, probably a couple of years.

An $11-million price for the Institute plant—and that's double present depreciated book value—works out to a per ton price of $90, even on the basis of 122,000 tons a year of capacity. This price is within the range of per ton of capacity prices paid this past year for the 25 government rubber plants, including a dozen GR-S plants. These ranged from a low of $53 per ton to $163, the latter for the relatively small Baytown, Tex., GR-S plant sold last summer when the rubber supply shortage was most critical. No other GR-S plant came near the $163 per ton price paid for Baytown. But it should be noted that bids were closed on these 24 plants when the rubber boom had been barely launched. The Institute plant bidding took place at a time when new rubber consumption records were being set each month.

Monopoly Aspects Different

The second question—the monopoly issue—once again is likely to be the main battleground over which the contending forces in Congress will make their stand. Last spring there was a bitter fight over approving sales that gave the Big Four rubber companies 60% of the nation's 730,000-ton RS capacity, since these same firms also consumed the lion's share of RS produced in this country.

Goodrich-Gulf Only 20% of Total RS

Sale of the Institute plant to Goodrich-Gulf would swell the Big Four's share to 70% of the capacity of former government GR-S plants—that is, 70% of the larger total of 733,600 tons plus 122,000 tons, or 855,600 tons. Goodrich-Gulf alone would see its share rise from 12.3% of the lower total (represented by its 90,000-ton RS plant at Port Neches, Tex.) to about 20% of the 855,600 ton total. That would put it ahead of the former leading producer, Firestone Tire & Rubber Co., which had 17.7% of the 733,600 tons of former government plant now in private hands and will have a somewhat smaller proportion of total private synthetic rubber capacity if and when Institute is sold. That Goodrich-Gulf also has been cut in for a half-share in the world's largest butadiene plant—the 200,000-ton plus plant at Neches—may also enter the argument against approving its purchase of the Institute plant.

The Disposal Commission hopes to cut down this argument chiefly by citing the expansions undertaken or planned by all RS producers since the plants went private last spring. The Commission will also point out that Congress did approve the earlier sales program giving Firestone a 17.7% share—and that there's not a significant difference between 17.7% and 20% (it seems doubtful that the Commission will carry the argument further by claiming sale of Institute to Goodrich-Gulf will provide stiffer competition for Firestone from Goodrich).

The expansion figures will be cited as evidence that the major test for approving the earlier sales—creation of a free, competitive private synthetic rubber industry—has been fully met. The Commission has reports from its former customers showing that planned expansions will bring total RS capacity to 1,056,000 tons. Everyone is expanding, these reports show, but Goodrich-Gulf, which is counting on the Institute plant as its expansion.

Disposal Attractive to West Virginia

Other factors are the cost of maintaining the Institute plant in standby for an indefinite period as against an immediate recovery of $11 million for the public; and the desirability—felt particularly keenly by West Virginia's Congressional delegation—of reviving job opportunities in one of the nation's currently depressed economic geographical areas. Goodrich-Gulf

figures that Institute's present complement of 30 maintenance employes will be increased to about 300 workers of all types when the plant's first 40,000-ton unit is reopened, and up to 500 when all three units are operating. That employment can create a lot of business in a state where some 10% of the employable manpower is barely subsisting on a government dole.

Reactivation Costs High

As for the economics of the plant itself, it is plain that Goodrich-Gulf faces some problems which will take money and time to overcome. Butadiene is in tight supply. The Institute plant can get enough to operate at 40,000 tons now from Neches and from a second 30,000-ton alcohol-butadiene unit just reactivated at the government plant at Louisville, Ky., operated on lease by Publicker Industries, Inc. Large additional supplies of butadiene probably must await the construction of additional butadiene plants elsewhere.

The Institute plant is equipped to make hot rubber only, and that by the batch method of processing. There is little demand for hot rubber, and batch processing is costly. A substantial part of the plant's capacity must be converted to cold rubber, and new equipment must be installed to take advantage of the cost savings obtainable through continuous processing. Institute lacks a boiler and water plant of its own, having relied on utilities furnished from adjacent properties of Union Carbide & Carbon. Goodrich-Gulf will have to provide its own utilities for Institute.

Marketing Prospects Good

The plant, while remote from the chief sources of low-cost butadiene, is well located for marketing its end-product. Butadiene can be shipped up by water routes to the plant gate at a small additional charge; so the problem is not a grave one. Good water and railroad routes are available to Institute, which is on the New York Central Railroad and has a clear channel to the Ohio River through the tributary Kanawha River. The big eastern and Ohio Valley markets are at Institute's doorstep. Goodrich-Gulf is expected to sell most of Institute's product to the small—as well as some large—firms that abound in the region. More than half of the initial 40,000 tons will be made available to small business users.

Commerce Department Defense Plans

Secretary of Commerce Sinclair Weeks in a recent report to President Eisenhower and Congress stated there will be an increasingly pressing need of "several years" to boost world output and consumption of synthetic rubbers in order to meet all demands for new rubber.

"An increased production and use of synthetic rubbers both in this country and abroad," the report said, "seems to be necessary to maintain equilibrium in rubber supply and demand. This need will probably become more pressing for several years. For the longer term, assuming world peace, the course will depend on the extent to which natural rubber production may increase, the extent to which use of synthetic rubber of present or new types may replace natural rubber, and the rapidity of growth of consumption of rubber throughout the world."

The report, the seventh annual summary of the government's rubber activities presented by the Secretary of Commerce, as required under the Rubber Act of 1948, extended, was prepared in the Rubber Branch of the Business & Defense Services Administration. The report is for sale at 15¢ a copy by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

The section of the report dealing with defense preparedness activities includes some hitherto unreported information and is reproduced in full, below:

"The Business & Defense Services Administration records and personnel would be the nucleus for any emergency industry control operation, under present plans, and the compilation of essential records for use in emergency is a major and continuing task. Analysts of the Rubber Branch have summarized rubber information in base books dealing with distinct groups of strategic materials and rubber products, deposited at the BDSA relocation center. In the relocation exercise conducted by BDSA in June, 1955, the material in this rubber file was tested as to adequacy for use in making preliminary decisions in the supposed emergency.

"Conferences have been held between officials of Business & Defense Services Administration and representatives of rubber manufacturing companies to enlist the voluntary cooperation of the company to the extent possible in the program for promotion of defense and continuity of industry production in case of attack. Pertinent activities of other companies are described, and the development of a definite plan of action by the company is encouraged.

"Programs for the expansion of facilities covering medium and large-size pneumatic tires, high-pressure wire braided hose, and other rubber products which have high military use were under constant review. As of the end of the period a very large percentage of the expansions authorized was completed.

"The Department of Commerce has been called upon to review the estimates for civilian emergency requirements for rubber in case of war. Industry cooperation in this task was enlisted through The Rubber Manufacturers Association, Inc., whose statistical subcommittee has been authorized to prepare estimates, and has held preliminary meetings. It is now expected that estimates will soon be submitted. Meanwhile, Rubber Branch analysts have also prepared data on this subject.

"With the transfer of the government-owned synthetic rubber facilities to private industry, the Commerce Department began collecting from the private owners the information concerning production, stocks, and shipments of synthetic rubber previously available centrally from the Federal Facilities Corp. This information is collected on a plant basis, following a directive from the Bureau of the Budget."

National News

New Records for All Product Divisions in 1955, RMA Says

The Rubber Manufacturers Association, Inc., in its year-end statement emphasized that every product division in the industry had shared in posting new production and sales records during 1955. New rubber consumption for the year was estimated at more than 1,500,000 long tons, 22% more than in 1954, and 12% more than the 1,338,309 long tons consumed in 1953, the previous record consumption year. In addition, it was estimated that reclaimed rubber consumption will reach 312,000 tons.

Pneumatic tire production, bellwether of the industry tonnagewise, topped the previous record by more than 15 million units. Production of truck and bus, passenger and motorcycle, and agricultural tires totaled 115,090,000 units, as against 99,-950,000 in 1953, the previous peak, and 92,205,000 in 1954. The breakdown by types appears in the table which follows in the next column:

PNEUMATIC TIRE PRODUCTION

(1,000 Units)

	1953	1954	1955
Passenger & motorcycle	81,504	76,858	97,000
Truck & bus	14,690	12,347	14,300
Farm tractor & implement	3,756	3,000	3,790
Totals	99,950	92,205	115,090

RMA President Ross R. Ormsby pointed out, moreover, that the volume of business in non-tire products passed the $2-billion mark for the first time in 1955. The previous high was in 1953, when the figure was placed at $1,956,777,000. These manufacturing groups include rubber footwear, industrial rubber goods, latex foam products, molded, extruded, and lathe-cut products, belting and hose, adhesives, rubber flooring, heels and soles, rubber drug sundries, hard rubber, and coated fabrics among others.

With its wider use in automobiles and buses and its expanding use in the bedding and upholstery fields, foam rubber accounted for a large proportion of the estimated 160,000 tons of liquid latex rubber (dry weight) consumed in 1955, compared with 132,000 tons in 1954.

General industrial expansion and the broad demands for appliances sparked by the high level of home construction were reflected in record production of belt, hose, molded and extruded goods, and flooring. The production curve for those products was paralleled in rubber hospital and surgical goods, and rubber sundries in the field of infants' and sports goods, the RMA reported.

Viewing 1956 from the new rubber consumption and rubber goods production plateaus reached at the year's end, the Association expressed confidence that the industry will maintain a high level of activity over the next 12 months.

The 1955 rubber consumption record was made possible only by the high production in the synthetic rubber plants, which not only bridged the gap between demand and overall short world supply of new rubber, but exercised a braking effect on the natural rubber market.

The RMA predicted that substantial expansions of U.S. synthetic rubber producing capacity announced over recent months would further stabilize raw material costs as new units come into production. Total synthetic rubber production reached an annual rate of 1,057,000 long tons in October and GR-S or RS types reached an annual rate of 869,760 long tons. The highest annual rate of GR-S achieved under government operation since World War II was 842,964 long tons in May, 1953, but that was when all facilities were being operated, including the largest single plant, at Institute, W. Va., which is now inactive and still in government hands.

Prices of the various types of synthetic rubber have held at essentially the same level throughout the year as under government operation, despite the pressure of high demand on short supply. Spot closing prices for #1 RSS, on the New York Commodity Exchange ranged from 29¾ to 52¢ a pound between March 8 and December 5, 1955, however. In approving the sale of the GR-S synthetic rubber plants to private industry, Congress required "moral" pledges of the buyers to hold production of synthetic rubber at a level high enough to assure an adequate supply at fair prices to all non-producers of this-type rubber who are rubber consumers.

"As regards synthetic rubber, the record to date indicates that this new industry has met those conditions in every respect," Mr. Ormsby declared.

The RMA said it was the composite view of industry experts that United States consumption would reach approximately 1,480,000 long tons of new rubber in 1956. World rubber consumption in 1956 was estimated at a new record of 2,980,000 long tons.

To meet this demand, it was estimated that producers of natural and synthetic rubbers would market 3,190,000 long tons of new rubber, leaving an estimated 210,000 long tons for absorption into industry and government stocks. The free world's synthetic rubber production in 1955 was given at less than 1,100,000 long tons, but the RMA said the industry estimated it would rise to 1,315,000 long tons in 1956 and 1,500,000 long tons in 1957.

Factory employment in the rubber goods manufacturing industry averaged 214,500 production and maintenance employes for the first nine months of 1955, as compared with 192,600 for the same period of 1954. The most recent U.S. Bureau of Labor Statistics report indicates that average hourly earnings in the tire and tube branch of the industry ross from $2.25 per hour in September, 1954, to $2.45 per hour in September, 1955.

Although the industry in the United States is now using synthetic rubber to meet more than 60% of its new rubber needs, it still consumes substantial quantities of natural rubber in the 30 grades covered by RMA Type Descriptions and Packing Specifications. Produced in widely separated areas by peoples of many tongues and being an agricultural product influenced by different soils and climates, natural rubber is not susceptible to the quality controls possible in the production of synthetic rubber, the RMA explained.

Uniform physical properties and cleanliness have been important industry problems since the earliest days of natural rubber. A major step was taken toward the solution of these problems in 1955, when meeting in New York under auspices of the RMA and the Rubber Trade Association of New York, 75 delegates from 23 rubber organizations in 10 other countries set in motion machinery designed to bring all commercially marketed natural rubber within the limits at first of 36 and ultimately 30 universally agreed types. A proposal to implement these recommendations will be circulated to all interested organizations in the world by the RMA and the RTANY early in 1956. This is the first time in the 120-year history of the rubber industry that the many diverse elements of the industry have come anywhere near such complete agreement on natural rubber quality standards.

1955 Record Year To Be Followed by 10 Years of Further Expansion—Litchfield

According to P. W. Litchfield, chairman of the board, Goodyear Tire & Rubber Co., 1955 was a record year by every measurement for business, with everything climbing and growing—payrolls, employment, production, and sales.

All of the factors which made 1955 a banner year are still with us as we enter 1956. Despite the fact that 1956 is an election year, there is reassurance from the fact that underlying everything there is a strong conservative trend, Litchfield added.

In a large measure responsible for the progress made in this country during recent years has been the substantial improvement in the business climate when our economic development has surged forward, in the face of forecasts of a postwar depression. With continued improvement in this climate, we have every reason to believe that we can go on to even greater progress.

Against this backdrop of a booming American economy and expanding business world-wide, business in general and the rubber industry in particular face the future with optimism.

The best barometer of activity in the rubber industry is new rubber consumption, and in 1955 the industry in the United States used a record of 1,510,000 long tons, Litchfield reported. The estimate for 1956 was placed at 1,475,000 long tons, but if the automobile industry continues at the present rate, more rubber will be consumed in 1956 than in 1955, he added.

Replacement tire sales in 1956 are expected to exceed 1955 figures because more vehicles will be in operation. Also, the question, "How many passenger cars will be built in 1956?" is very important, because the rubber industry provides five tires for every car built.

The Goodyear chairman sees industry production and shipments of hose, belts, and other non-tire items exceeding those of 1955, in 1956, owing to the high level of production and construction and the generally expanding economy.

With sales exceeding the billion-dollar mark for the first nine months, 1955 will be a record year for Goodyear, and looking ahead over the next 10 years, Litchfield sees the American economy expanding to new heights, and bigger markets developing overseas. Accordingly, Goodyear is embarking upon a plant expansion program calling for a capital expenditure of $114 million, the biggest in the company's history.

Great as are the prospects in the domestic market, Goodyear believes its foreign operations wil grow even faster and is currently expanding overseas plants and building new plants in Scotland, Venezuela, the Philippines, Colombia, and Melbourne, Australia.

Firestone Says Purchase and Expansion of Synthetic Plants Significant 1955 Development

The purchase and the expansion by private industry of the synthetic rubber producing plants formerly owned by the government were among the most significant developments in 1955, Harvey S. Firestone, Jr., chairman of the Firestone Tire & Rubber Co., declared in his year-end statement.

Major expansions of producing facilities for synthetic rubber and chemicals and for the manufacture of tubeless tires, foam rubber, industrial and mechanical goods characterized the year for the Firestone company, which for the second time in its history had a sales volume exceeding $1 billion.

By substantially increasing the output of synthetic rubber during 1955, the industry was able to provide its products to customers at much lower costs than would

have been possible if it had been forced to rely upon natural rubber alone. The outlook for new and expanded use of rubber products is most encouraging, it was added.

During 1955, Firestone became the largest producer of rubber in the world with the purchase and the expansion of two synthetic rubber producing plants and with the increase of the output of its natural rubber plantations in Liberia. Annual capacity of Firestone's synthetic rubber plants is being increased to 190,000 tons from 130,000 tons, or 46%, and additional expansions are planned. Besides, the company will soon begin construction of a new 40,000--ton-a-year butadiene plant in the Gulf Coast area.

Because more motor vehicles will be in use in 1956 than at any other time in our history, Firestone also looks for an increase in the tire replacement market. Continuing high-level production of automobiles indicates a large original equipment tire market also.

The demand for foam rubber for upholstery and transportation uses is increasing rapidly, and new applications of plastic foam, improvements in latex-base paints, increased use of rubber air springs for buses, trucks, and trains, and the development of improved types of resins and synthetic rubber indicate that greater diversification lies ahead for most segments of the rubber industry, the Firestone statement said.

1956 To Approach 1955 Record Year—Collyer and Richardson

Production and sales of rubber products during 1956 may approach levels nearly as high as those reached in 1955, record sales year in the history of the rubber goods manufacturing industry, John L. Collyer, chairman of the board, and W. S. Richardson, president of The B. F. Goodrich Co., said in a year-end statement.

Consumption of new rubber in the United States in 1956 was estimated at 1,465,000 long tons, of which 62% of the total will be synthetic rubbers. Ample supplies of American synthetic rubbers will be available during 1956 to meet increasing demands as facilities are being expanded from coast to coast.

Industry tire sales in 1956 will total about 110,000,000 units. Sales of replacement passenger-car tires may be about one million more than the 50 million sold during 1955; while total passenger-car tire sales, replacement plus original equipment, may decline to 90 million from 1955's total of more than 93 million units, the Goodrich company executives further declared.

The decision of the automotive industry to use tubeless tires as original equipment climaxed a pioneering campaign started by Goodrich in 1947 when the company announced the invention of the first tubeless passenger-car tire. About 60% of the nation's passenger-car tire sales in 1955 were tubeless tires, a product entirely new only eight years ago, the Goodrich statement revealed. Goodrich has expended more than $55 million to date in the invention and the development of tubeless tires. A new line of tubeless truck and also low-pressure tubeless off-the-road tires were introduced by Goodrich in 1955.

In a review of actions taken in 1955 to improve and increase the company's manufacturing, distribution, and customer service facilities, mention was made of a new acrylonitrile plant at Calvert City, Ky., a $2.5-million expansion of a nitrile rubber plant at Louisville, Ky., tire plant expansions in Los Angeles, Calif., and in Oaks, Pa., and latex foam rubber plant expansions in Shelton, Conn., and Waterville, P.Q., Canada.

Research activities by scientists of Goodrich-Gulf Chemicals, Inc., resulted in reproducing the true molecule of natural rubber, and radiation studies at the B. F. Goodrich Research Center provided materials capable of extending ten times the life of rubber products exposed to atomic radiation.

U. S. Rubber Expects $1 Billion Sales in 1956

United States Rubber Co. expects its sales will pass the $1 billion mark in 1956 for the first time in its history, H. E. Humphreys, Jr., president, said in his year-end statement.

This sales volume will represent a gain of between 8% and 10% over the company's sales in 1955. The 1955 sales of more than $900 million also will set a record.

"We expect increased business in replacement passenger-car and truck tires," Humphreys stated. "Our business is expanding in plastics, plastics products, chemicals and synthetic rubber. We look for continued growth in footwear, foam rubber, industrial rubber goods, textiles, and foreign business," he added.

U. S. Rubber expects to spend about $36 million in new plants and equipment in 1956, which is about a million more than in 1955 and $5 million more than the previous record $31 million spent in 1954.

The rubber industry, which set a new sales record of $5¼ billion in 1955, should exceed that record in 1956; sales could go as high as $5¾ billion, the U. S. Rubber president prophesied.

Rubber consumption in 1956 was estimated at about the same 1,500,000 long tons used in 1955. The general price level of rubber goods, which increased slightly in 1955 owing to higher raw material and labor costs, will contribute to the expected dollar sales increase although rubber consumption will remain about equal to the 1955 figure.

The proportion of synthetic rubber used by the industry will continue to rise, probably reaching 65% in the latter half of 1956. About 60% of total new rubber consumption was synthetic in 1955. Industry demand for synthetic rubber has far exceeded plant production capacities, partly because of high prices for natural rubber and partly because of the superiority of synthetic in many applications, it was added.

Consumption of synthetic rubber abroad in 1956 is expected to exceed 260,000 tons and conceivably to reach 300,000 tons despite the shortage of dollars, compared to the only 155,000 tons consumed abroad in 1955.

Armstrong's Machlin Sees 1956 Record Year

The tire industry on the whole has operated at high levels of production and earnings, F. Machlin, president, Armstrong Rubber Co., reported in his year-end statement. New products were received enthusiastically by consumers and contributed greatly to this overall result. The tire industry will unquestionably continue the development and the production of new products to meet customer demands.

The demand for replacement tires during 1956 should continue at record levels as a result of the large numbers of new passenger cars and trucks manufactured and sold during 1954 and 1955. While keen competition is expected to continue in the tire industry, indications point to higher sales for Armstrong, it was said. The company will continue a very active research and development program and also its policy of maintaining manufacturing facilities in top-notch condition, equipped with the latest and most modern available equipment.

Machlin expressed appreciation for the cooperation received from the company's customers, suppliers, employes, and shareholders which helped make possible the achievements of the past year.

Good Sales, Less Profits in 1956—Cooper Tire

W. B. Brewer, president, Cooper Tire & Rubber Co., sees unusually good prospects for the rubber industry during the early months of 1956. The demand for replacement tires should be high in view of the record-breaking number of new cars sold in 1955. The expected reduction in the output of new cars in 1956, as compared to 1955 output, will shrink the market for original-equipment tires, however, he added. This situation, together with increased tire production capacity being installed, is expected to result in continued competitive pressure in the replacement-tire field.

For the expected volume of rubber products there should be no critical shortages of raw materials in 1956, which should enable the industry to give better attention to other problems.

In summary, this industry executive looks for the 1956 sales volume in the rubber industry to be good, but with profits held to a relatively low figure on a percentagewise basis.

O'Neil Says 1956 Industry Sales May Top $6 Billion

William O'Neil, president, The General Tire & Rubber Co., forecast the greatest year in the rubber industry's history in 1956 with overall sales likely to top $6 billion for the first time.

An unprecedented demand for replacement tires for automobiles, trucks, and off-the-road vehicles will challenge the industry's production facilities in addition to supplying the high-level needs of automotive and truck companies now manufacturing vehicles at a 130,000-135,000 rate per day.

As the originator of the 14-inch diameter tire, General is ready to produce the smaller-size tire if and when it becomes the original equipment size of tire on new automobiles. This change is likely to come late in 1956 with the first of the new 1957 automobiles.

O'Neil predicts one of the finest years in the company's 41-year history for 1956.

"While we look for a high-level operation over-all in the rubber industry, we are anticipating gains greater than the industry average bacause of expansions we have undertaken recently," he explained. "Our expansions will enable us to catch up to a product demand which has been in excess of production in 1955."

Expansion programs have been undertaken in tire manufacturing facilities at General Tire's Akron, O., and Waco, Tex., plants. Another entirely new plant most likely will be constructed in 1956.

The international business outlook is also encouraging to the executive.

"All of our plants outside the United States are geared up for capacity production during 1956, following very successful operations in 1955," he added.

Robins Believes 1956 May Surpass 1955 Record Year

Thomas Robins, Jr., president, Hewitt-Robins, Inc., believes business in general in 1956 will equal and perhaps surpass the record levels established in 1955.

As for the non-tire segment of the rubber industry, which is the principal industry of which Hewitt-Robins is a part, he looks for sales of about $2.2 billion, a gain of about 5% over 1955 figures. Sales of non-tire products comprise about 53% of the industry's total sales.

Robins explained that sales of non-tire products have grown faster than tire sales in recent years, and this trend is likely to continue as the result of the development of new products and the steady rise in the consumption of such standard items as conveyor belting, foam rubber, rubber floor tile, industrial hose, and rubber footwear. It was estimated that 560,000 long tons of rubber will be used in non-tire products in 1956, about 38% of the total rubber expected to be consumed in the United States. Non-tire products as a group require less rubber per dollar's worth of finished goods manufactured because most of these products contain a higher proportion of textiles and other materials than do tires.

One of the chief problems of the rubber industry in 1955 was the shortage of natural rubber latex and the consequent doubling of its cost. Although it is difficult to predict how much improvement may be expected with this problem because of many economic and political factors involved, Robins feels the worst is behind us.

Seiberling Points Up 1955 GR-S Plant Transfer and Tubeless Tires

J. P. Seiberling, president, Seiberling Rubber Co., stated in his year-end report that the two outstanding developments in the rubber industry in 1955 were the sale of the GR-S type rubber plants to private industry and the introduction, on a large scale, of tubeless passenger and truck tires as original equipment.

The year 1955 was a period of increased use of rubber products, particularly in the passenger-car tire and truck tire field, he added, and said that the outlook for 1956 is for continued high rubber consumption.

Seiberling anticipates the demand for passenger tires in 1956 will exceed that of 1955 by 10%; while truck tire consumption will be up 5%.

During the past year the synthetic rubber industry set new production records and acted as a great stabilizing force on the price of natural rubber, which, being in short supply and high demand, would otherwise have risen to completely unrealistic price levels.

Seiberling Rubber Co. expects 1956 to be another year of large consumption of rubber products and profitable operations, in which it expects to share fully.

Natural Rubber Industry Faces 1956 Confident and Competitive

According to H. C. Bugbee, president of the Natural Rubber Bureau, Washington, D. C., the next decade will continue a dynamic economy, and in that economy there will be rising demand for rubber that will need full production of both synthetic and natural.

"We believe, too," he added, "that the competition between natural and synthetic will react to the benefit of the buying public. It will result in more and better rubber products at lower cost; and when the price, production, and quality chips are down, natural will hold its competitive own in a future we face with every confidence."

NRB said that while the final figures for 1955 new rubber use are not tabulated, it looks as though U. S. consumers used a record 1,525,000 tons of rubber, of which some 630,000 tons, or 40%, were natural.

The natural rubber industry's optimism is not based on these 1955 figures, because the 1955 price was not the long-term norm. The 1955 price was based on continuing an unexpectedly high consumer demand, in conjunction with a shortage of the competing synthetic commodity.

For 1956 and the future beyond, Bugbee said, "We don't know what the prices will be in 1956. Rubber is in a free market, and if the demand continues, it is likely that natural will continue for some time to command a premium over synthetic. . . . We're looking to a future when natural will be competing for a normal-demand market with synthetic in full supply."

Reference was made to the RMA estimate that rubber consumption in 1960 will reach 3,500,000 long tons a year, and the prediction by Harvey S. Firestone, Jr., that 1965 consumption will reach 4,300,000 tons. The natural rubber industry believes that it will get its full share of this expanding market for rubber.

In natural rubber laboratories all over the world scientists are hard at work to improve the advantages nature originally gave to the product of the rubber tree. In addition, a technical liaison service for U. S. consumers is planned, and new methods developed in the natural rubber laboratories will be explained, and problems raised by American technologists will be transmitted back to these laboratories for study and solution.

Scrap Rubber Outlook Not Considered Good

In a year-end summary, Samuel Tanney, Tanney-Costello, Inc., president of the National Association of Waste Material Dealers Scrap Rubber & Plastics Institute, emphasized that although business generally has been booming, the scrap rubber business has been in the doldrums during the past year, and the prospects are not very bright for the coming year.

Except for butyl tubes, the market has otherwise been featureless, and during most of the year scrap tires have been moving at a price under 1¢ a pound. While some collectors feel this price is too low, the Scrap Rubber Institute considers this price to be the proper market value, based on the economic law of supply and demand.

Freight rate increases of 50 to 60% in the past couple of years have narrowed the radius which can be tapped as a source of scrap rubber, creating a situation which has caused many dealers to get rid of their collections either by consigning them to the dump, burning them, or in some instances actually paying the freight to the consuming mill. Also, responsible collectors will not now, nor will they be easily encouraged to give their time, money, and energy to the accumulation of scrap rubber—which means a breakdown in the collection system which, if needed

at some future date, will have to be revived at a penalty, it was said.

Many individual truckmen are not engaged in collecting scrap rubber, as such, but are rather seeking out casings suitable for retreading and repairing, so that scrap tires for reclaiming represent to them only a by-product of the repairable casing business.

Reclaimed rubber is under pressure from GR-S type rubber, and while temporarily GR-S type rubber is in short supply, this supply will be augmented as new production comes into the market so that unless the reclaimer can find additional and substantial other uses for his product, there would appear to be little prospect of the reclaimer using more scrap rubber in 1956 than he did in 1955, this statement said.

The scrap plastics industry enjoyed fairly good business during the first half of 1955, and this scrap moved in good volume at fair prices. With new and substantial quantities of new material coming into the market, however, a rather sharp decline in the price levels of both vinyl and polyethylene plastic scrap have been experienced during the past few months. Since the production of new material is expected to increase progressively, the Scrap Rubber & Plastics Institute head said he could not feel encouraged that this plastics scrap would enjoy the price position prevailing earlier in 1955.

November Record Synthetic Month

The RMA, in its monthly release of rubber statistics dated December 21, pointed out that for the second month in a row a new all-time record high production of synthetic rubber was established in the United States. During November, 1955, production of all types of synthetic rubbers was 91,249 long tons, as compared with the previous record established in October, 1955, of 87,764 long tons. Principally responsible was a new increase of GR-S type production from the 72,499 long tons registered in October to 74,939 long tons produced in November.

Of equal significance was the fact that new rubber consumption in the United States during the 11-month period ended November amounted to 1,402,457 long tons, exceeding new rubber consumed during any full year in the history of the rubber industry. During November, 1955, the consumption of 135,081 long tons was only slightly below the all-time record monthly high of 136,781 long tons established in October, 1955. Consumption of new rubber in the United States for all of 1955 will most certainly exceed the 1,500,000-long-ton mark.

Consumption of all types of synthetic rubber totaled 82,080 long tons, against the 81,540 long tons consumed in October and the 57,287 long tons of synthetic rubber consumed during November, 1954.

Natural rubber consumption during November, 1955, amounted to 53,001 long tons, against the 55,241 long tons consumed in October and the 53,326 long tons consumed in November, 1954. During the first 11 months of 1955, consumption of natural rubber in the United States reached 584,101 long tons.

Consumption of reclaimed rubber by the industry was estimated at 27,400 long tons during November, as compared with the 26,606 long tons for October and 22,321 long tons for November, '54.

Other Industry News

General Tire, Gas Company to Construct RS Plant

The nation's first synthetic rubber plant built entirely by private capital will be constructed at Odessa, Tex., by The General Tire & Rubber Co., Akron, O., and El Paso Natural Gas Co., El Paso, Tex.

The plant will produce GR-S type synthetic rubber (RS is probable new general abbreviation) at an estimated annual capacity of 40,000 long tons, according to a joint announcement. The facilities, the first of its kind built in this country during the postwar period, will operate on a completely integrated basis. Production is scheduled to start about July 1, 1957.

A long-term agreement has been signed by the two companies covering the production and sale of styrene and butadiene to supply the new copolymer plant, William O'Neil, president of General Tire, and Paul Kayser, president of El Paso Natural Gas, revealed.

The overall production plan for the facilities includes the extraction of raw materials from the ground, their conversion into styrene and butadiene, and the subsequent manufacture of GR-S type rubber in a single production flow.

Odessa is located in a rich oil-producing section of Texas. El Paso Natural Gas, said to be one of the nation's major natural gas pipeline companies, will be associated in the venture with Odessa Natural Gasoline Co. of that city.

"The plants built during the war emergency by the government are now nearly 15 years old, and their equipment does not lend itself readily to such improvements as we have developed in processing synthetic rubbers," Mr. O'Neil said in comment.

Mr. Kayser said his company now had access to 25,000 barrels a day of natural gasoline, butane, and propane. This venture will be El Paso Natural Gas' first in the chemical industry.

Celanese Begins Full-Scale Production of Fortisan-36

Commercial production of Fortisan-36, a specifically industrial rayon fiber, has been launched at its Rome, Ga., plant by Celanese Corp. of America, New York, N. Y. Estimated annual production is put at three to four million pounds.

The fiber is reported to have great tensile strength, low elongation, and high dimensional stability, indicating, according to the company, that it will find application in such fields as V-belts, power transmission belting, high-pressure hose, conveyor belts, truck tires, plastic laminates, oil hose, and tarpaulins.

Fortisan-36 has been available for some time in semi-commercial quantities. In November, Thermoid Co., Trenton, N. J., revealed that it has been using the fiber as a reinforcing element in its industrial V-belts.

The fiber is chemically akin to Celanese's Fortisan, a regenerated cellulose yarn introduced in 1940. Fortisan-36, however, is made by what is termed entirely new and different equipment. The fiber will be made available initially in 800 and 1,600 denier continuous filament, with other sizes in the heavy denier range to be offered at a later date.

In a talk given by Harold Blancke, Celanese president, at ceremonies attending the start of Fortisan-36 production at the Rome plant, it was pointed out that in plotted load-denier curves for all available industrial filament yarns, in relation to the elongation of the yarn, there would be a blank area between the curve for glass fibers and that of the nearest synthetic organic fiber.

"The curve for Fortisan-36 lies in this blank area," the Celanese executive said. "Thus, you see, Fortisan-36 possesses a combination of characteristics not previously available. And that is why we set out to make this fiber for industry."

Equipment for the Fortisan-36 process covers 60,000 square feet of floor space. The Rome plant also produces rayon and acetate fibers. W. E. Crooks is plant manager.

Clarence M. Brown has retired as chairman of the board of Pittsburgh Plate Glass Co., Pittsburgh, Pa., and has been succeeded by **Harry B. Higgins**, president of the company since 1944. **David G. Hill**, vice president in charge of glass manufacturing, has been elected president, and **C. Robert Fay**, vice president and comptroller, has been elected to the directorate.

Shift Goodyear Sales HQs

A new Midwest sales division with headquarters at Des Moines, Iowa, has been created by The Goodyear Tire & Rubber Co., Akron, O., it was announced by Victor Holt, Jr., vice president in charge of tire sales. C. M. Van Epps, formerly district manager at Chicago, has been named manager of the new division.

Other changes in the Goodyear sales structure were also made known. The northcentral division, formerly at Chicago, will be moved to Cleveland, with headquarters at the Goodyear Distribution Center, and is to be designated the central division. L. W. C. Dye will continue as division manager.

The names of all other Goodyear sales divisions, with the exception of the western division, have been changed. Northeastern division becomes eastern; southeastern becomes southern, and southcentral becomes southwestern. Headquarter locations and managers of these divisions remain the same.

New Phillips Akron Office

A new Akron, O., district office of its plastics sales division will be established by Phillips Chemical Co., subsidiary of Phillips Petroleum Co., Bartlesville, Okla., with W. M. Larsen, formerly marketing assistant in the parent firm's sales department, as its manager.

According to Phillips, this is the fifth such newly created office within recent weeks as the company prepares to meet the demand indicated by the acceptance of its new olefin polymer family, Marlex. Commercial production of Marlex is scheduled to begin in mid-1956 at the company's Adams Terminal plant site on the Houston Ship Channel near Pasadena, Tex.

Also announced was the appointment of M. B. Bistline as sales engineer on the staff of the New York plastics sales office under W. C. Douce, district manager. Mr. Bistline was previously a development engineer in the company's research and development department.

Reduces Amine Prices

Substantial reductions in the prices of its tertiary-butylamine and its Primene 81-R have been announced by Rohm & Haas Co., Philadelphia, Pa. The price of tertiary-butylamine is now 45¢ a pound, tank cars and tank trucks; 47¢, carloads and truckloads; and 47½¢, less than truckload, in drums. Corresponding prices per pound for Primene 81-R are 35¢, 37¢, and 37½¢. All prices are f.o.b. Houston, Tex.

According to D. S. Frederick, vice president of the firm, these reductions are the result of production economies made possible by large-scale operation over the past two years at the company's plant near Houston.

Potential fields of application for these amines are listed as the manufacture of rubber chemicals, surface-active agents, dyestuffs, corrosion inhibitors, photographic chemicals, and pharmaceuticals.

Shell Latex Expansion

New facilities for the production of cold (LTP) high solids GR-S type latex, the constituent of foam rubber, will be built at the Torrance, Calif., synthetic rubber plant of Shell Chemical Corp., New York, N. Y. This will be the first cold high solids latex made west of the Rocky Mountains, the company says.

The new facilities will include additional basic reactors and latex finishing equipment and "will be a part of a general program of additions and improvements designed to increase both the diversity and the quality of the plant's output."

According to R. C. McCurdy, president of Shell Chemical, the new equipment, in addition to increasing the flexibility of the plant for production in normal times, will, in a period of national emergency, assist in turning out more of the essential types of rubber than has hitherto been possible.

Virtually 100% H_2O_2 Made By New Becco Technique

The commercial development of a nearly anhydrous hydrogen peroxide has been announced by Becco Chemical Division of Food Machinery & Chemical Corp., New York, N. Y. The achievement is said to have resulted from a new continuous fractional crystallization technique, now patented by the company.

Although Becco does not list any immediate applications for the virtually 100% H_2O_2, Max E. Bretschger, president of the firm, calls it "a milestone in the history of the hydrogen peroxide industry." Becco introduced a 90% hydrogen peroxide in 1946, which is now used in rocket propulsion. The 90% concentration was thought at that time to be the practical limit of the anhydrous material, Becco says.

According to the company, the new process depends upon a continuous fractional crystallization, such that a solid phase of progressively higher hydrogen peroxide content moves in one direction through the apparatus, while a liquid progressively poorer in peroxide moves in the opposite direction.

The process is said to be an ideal complement to fractional distillation, which is commercially practical only up to about 90%. The crystallization process is most effective when operated with 90% feed stock. The take-off concentrations can be regulated to some degree; the practical maximum concentration is above 99.6% H_2O_2.

One of the apparent advantages of the new product form is its economical production. A second advantage is the almost complete rejection of impurities, resulting in a much lower impurity level than that allowed by ACS reagent specifications.

Optimum operation of the new fractional crystallization process is for more than 98% H_2O_2. The company will market the product as SP 100.

U. S. Patent No. 2,724,640, issued November 22, 1955, to G. G. Crewson and J. R. Ryan, and assigned to Becco, has been granted to cover the new fractional crystallization process.

Guiberson Expanding Plant

Construction has begun on new molded rubber goods producing facilities at The Guiberson Corp., Dallas, Tex., according to Gordon G. Guiberson, president. The expansion program also includes a new oil-field equipment manufacturing plant building.

Scheduled for completion at the end of the year, the expansion will increase the company's manufacturing plant working area by more than 80% and its rubber plant working area by more than 65%, it was revealed by Alex P. Smith, vice president and general manager.

According to company officials, expansion of the rubber plant will provide room for new equipment which will increase press line capacity by 15%, boiler capacity by 100%, and compound mixing capacity by more than 400%. New equipment will include a large refrigeration cooling system for rubber products compounding machinery which will allow maximum control of this type of processing.

Koylon Mattress Prices Up

United States Rubber Co., New York, N. Y., has announced price increases in its Koylon foam mattress and foundation sets ranging from $9.55 to $20 a set. The increases were made necessary by higher raw material and labor costs, Richard C. Emmons, sales manager, explained.

New retail prices for the full-size set include the following: Platinum Label, $169.50; Gold Label, $149.50; and Silver Label, $119.50. New prices for the twin-size set include Platinum Label, $149.50; Gold Label, $129.50; and Silver Label, $99.50.

Goodyear Buys New Plant

The Goodyear Tire & Rubber Co., Akron, O., has purchased a one-story high plant between Waukegan and North Chicago, Ill., to provide additional facilities for the manufacture of industrial rubber products. Located on a 57-acre tract of land, the plant is on the Skokie highway, one-half mile north of Illinois Route 176. It was constructed in 1951 and acquired from Motor Products Corp., Detroit, Mich.

The acquisition is part of the company's recently announced two-year expansion program to cost $100,000,000.

Testworth Labs Expand

Testworth Laboratories, Inc., Addison, Ill., has purchased the plant and property of Mandeville Mills, Carrollton, Ga., according to S. W. Campbell, Testworth president. The plant, 50 miles west of Atlanta, will be used to produce latex compounds for the upholstering, carpet, and paper converting industries. The facilities include more than 90,000 square feet of manufacturing and warehouse space and a rail siding with a 16-car capacity.

Ty Cobb has been named plant manager.

Fabian Bachrach

Max A. Minnig

William Wishnick

Robert I. Wishnick

Wishnick, Minnig Advanced

Robert I. Wishnick has been advanced to chairman of the board and chief executive officer of Witco Chemical Co., New York, N. Y., and Max A. Minnig has been elected president, with William Wishnick succeeding him as executive vice president of the company.

Board Chairman Wisnick is the founder of the 35-year-old chemical manufacturing firm, which began as a chemical distributor. Mr. Minnig joined the company in 1946 as head of its natural gas division and was named executive vice president in 1953. William Wishnick started with Witco in 1942 and advanced to treasurer in 1951 and to vice president in 1953.

Witco gives its carbon black capacity as 275 million pounds a year and reports that substantial expansions are under way. The company also produces such organic chemicals as stearates, plasticizers, and paint driers, as well as asphaltic products made by its Pioneer Products Division.

Witco recently acquired Emulsol Chemical Corp., manufacturer of surface active agents. Witco is also a half-owner of Ultra Chemical Works, producer of synthetic detergents, textile chemicals, emulsifiers, and industrial and household waxes.

Degree to BFG's Keener

J. W. Keener, vice president, The B. F. Goodrich Co., Akron, O., has received an honorary degree of Doctor of Laws from Birmingham-Southern College, Birmingham, Ala., from which he was graduated in 1928.

The degree was conferred upon the rubber company executive by Guy E. Snavely, chancellor and president of the college, during a convocation program commemorating the school's one hundredth anniversary. Dr. Snavely cited Mr. Keener as a "dynamic business leader and distinguished public servant."

Mr. Keener joined Goodrich in 1937 as a special analyst and rose through director of business research, assistant to the vice president in charge of finance, and assistant to the president, being elected vice president in 1946. He has served the Federal Government as consultant and advisor both during and after World War II.

Seiberling Liner Replacement

Seiberling Rubber Co., Akron, O., is producing a special material to replace inner liners on tubeless tires which need section repairs, according to W. T. Johnson, general sales manager.

The material is said to be a normal-curing, tough compound of natural rubber with the same air-retaining qualities found in butyl type liners, and it will blend during vulcanization with any type of inner liner used in other manufacturers' tubeless tires. The material is packaged in five-pound rolls.

A tubeless tire must have the inner liner replaced over the repaired area when a section repair is made, Mr. Johnson explained, adding that if it is not replaced, air seepage occurs through or around the repair unit, eventually causing ply separation.

Koppers Gets Dye Sales

A wholly-owned subsidiary of Koppers Co., Inc., Pittsburgh, Pa., will assume the marketing of the textile dyes of Pittsburgh Coke & Chemical Co., Pittsburgh, according to George M. Walker, vice president and general manager of Koppers' chemical division.

The subsidiary is American Aniline Products, Inc., Lock Haven, Pa., producer of dyes for the petroleum, plastics, leather, and paper industries, as well as dyes for textiles, including the synthetic fibers.

Under the terms of the agreement, the eight-member sales staff of Pittsburgh Coke will join American Aniline. Pittsburgh Coke will continue to produce a number of vat dyes not currently made by American Aniline, but all sales of these dyes will be handled by the Koppers subsidiary.

Firestone Division Shuffles

Division sales territories of The Firestone Tire & Rubber Co., Akron, O., have been realined to comprise seven divisions instead of the previous six, according to H. D. Tompkins, vice president in charge of trade sales

Two new divisions, the southeast and southwest, have replaced the company's former southern division. J. E. Davis, formerly manager of the southern division, has been named manager of the new southwest division, with offices in Houston, Tex.

W. S. McGilvray, heretofore district manager in Los Angeles, has been named manager of the southeast division, with headquarters in Atlanta, Ga.

Also, a new district office has been established in San Antonio as part of the southwest division. District manager there is W. H. Olivarri, formerly Houston district manager. Replacing him in Houston is G. G. Shelton, former district store supervisor there.

The new southwest division includes the districts of Dallas, Houston, Memphis, New Orleans, Oklahoma City, and San Antonio. The southeast division includes Atlanta, Birmingham, Charlotte, Jacksonville, and Richmond.

Monsanto Training Colonel

A U. S. Army Chemical Corps officer has been assigned to Monsanto Chemical Co. for a one-year tour of duty as part of the Army's Industrial Mobilization Training Program designed to train a nucleus of military specialists in industrial methods and practices.

Lt. Col. James O. Quimby, Jr., former deputy commander of the Pine Bluff Arsenal, will be offered production training through the St. Louis, Mo., firm's various operating divisions and staff departments. He received B.S. and M.S. degrees in chemical engineering from Alabama Polytechnic Institute in 1938 and 1939, respectively, and an M.B.A. degree from Syracuse University in 1953.

News about People

Norman R. Byrd has joined the organic research department, research division, of The Goodyear Tire & Rubber Co., Akron, O. He was formerly with the Jackson Laboratory of E. I. du Pont de Nemours & Co., Inc.

John A. Sherred, Frank L. Emert, and **H. Harold Bible** have been advanced to director of development, director of engineering, and director of manufacturing, respectively, for Lion Oil Co., El Dorado, Ark., a division of Monsanto Chemical Co.

Laurence Kogos and **Zavan T. Khachadoorian** have been advanced to technical director and chief chemist, respectively, of H. M. Sawyer & Son Co., Watertown, Mass.

Teh Fu Yen has been appointed to the diene synthetic rubbers section of The Goodyear Tire & Rubber Co.'s research division, Akron, O. A graduate of Huachung University, Wuchang, China, he later attended West Virginia University and Virginia Polytechnic Institute.

Ralph Seger and **Howard Chapman,** United States Rubber Co., development department, Detroit, Mich., have been named chairman elect and treasurer, respectively, of the Detroit Section of the American Chemical Society.

William F. Christopher has been advanced to manager of market development for the chemical development department of General Electric Co., Pittsfield, Mass. He was formerly manager of advertising and sales promotion for the department.

William F. Maloney has been assigned to the high polymer research section, research division, The Goodyear Tire & Rubber Co., Akron, O.

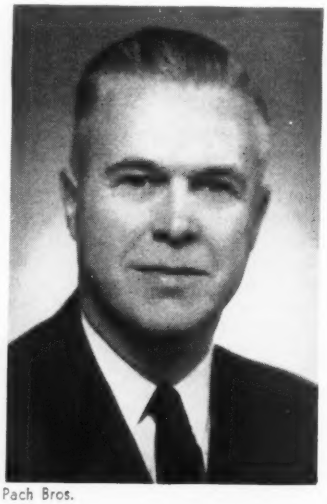
Herbert M. Kelton has been elected a director, a vice president, chairman of the finance committee, and a member of the executive committee of United States Rubber Co., New York, N. Y., succeeding **Arthur Surkamp,** who has retired, but who will continue as a director and member of the finance committee. **Frank J. McGrath,** formerly an assistant treasurer, succeeds Mr. Kelton as treasurer. Also elected were **Alva F. Myers,** to senior assistant treasurer, and **W. Richard Fish,** to an assistant treasurer.

George E. Foltz has joined the research department of Neville Chemical Co., Pittsburgh, Pa. Dr. Foltz was formerly with Columbia-Southern Chemical Corp.

Robert D. Kinny

Robert D. Kinny has been reassigned to sales representative to the Cincinnati area, working out of Detroit, by Pennsylvania Industrial Chemical Corp., Clairton, Pa.

Joe W. Misamore has been named advertising and sales promotion manager of the plastics products division of The B. F. Goodrich Co., Marietta, O.



Pach Bros.

Herbert M. Kelton

William H. Evans, vice president of Diamond Alkali Co., Cleveland, O., has been elected to the firm's board of directors. He has served with Diamond for 18 years.

William B. Goodwin has joined the polychemicals division of West Virginia Pulp & Paper Co., Charleston A, S. C., for product and uses development work on new products based on lignin.

William C. Decker, president of Corning Glass Works, has been elected a director of Dow Corning Corp., Midland, Mich., succeeding **Glen W. Cole,** who died recently. Mr. Decker joined Corning Glass in 1930, serving successively as manager of the industrial sales department, company treasurer, controller, and general manager of two operating divisions. He was elected president in 1946.

Felton Byrd has been transferred to the technical sales staff of Naugatuck Chemical Division, United States Rubber Co., New York, N. Y., with headquarters in Dallas, Tex. **Paul W. Bohne, J. P. Corkins,** and **B. S. Morgan** have joined Naugatuck's agricultural chemical staff.

Owen F. Beckmeyer, Vert C. Fraser, and **Richard W. McKay** have been advanced to plant manager, production manager, and technical manager, respectively, of the Avon Lake, O., general chemicals plant of B. F. Goodrich Chemical Co., Cleveland, O.

Bernard C. Barton has been appointed director of research and development for Texas-U. S. Chemical Co., New York, N. Y., where he will direct the company's research and development work on the production of improved synthetic rubbers and the expanded use of petrochemicals. He was formerly head of the rubber applications and synthetic rubber research department of the General Laboratories of United States Rubber Co.

Fabian Bachrach

Bernard C. Barton

Roger Knapp

Lenoir Black

John M. Bradley

Gordon Cook has joined Columbian Carbon Co., New York, N. Y., as general manager of colloidal dispersions.

Walter R. Roberts, for 20 years manager of silicate sales for Diamond Alkali Co., Cleveland, O., has retired and will be succeeded by **Clifford S. Hancock,** who will retain as well his current post of manager of calcium carbonate sales. Mr. Roberts has been associated with the company since 1923; Mr. Hancock since 1925. **C. W. Turner,** manager of detergent specialty sales, has been given added responsibilities for sales of detergent silicates.

Thomas E. Boyle has been appointed department manager, international manufacturing and technical services, for International B. F. Goodrich Co., Akron, O. He has been with Goodrich more than 29 years.

Harry Weist and **Roger Knapp** have joined the sales staff of C. P. Hall Co. of Illinois, Chicago, Ill., and will cover the Chicago area. **Lenoir Black** has also joined the staff and will be assigned to the southern area.

Fred C. Fernald has been elected a vice president of Godfrey L. Cabot, Inc., Boston, Mass., and its subsidiary corporations. He joined the company as general counsel in 1926 and has served as director, secretary, and clerk of the corporation.

Hugh S. Ferguson, president, Dewey & Almy Chemical Co., division of W. R. Grace & Co., New York, N. Y., has been named executive vice president in charge of the parent firm's chemical group. **Alexander T. Daignault** has been advanced to executive vice president and chief financial officer of Grace. Other Grace promotions include **Allen S. Rupley** and **Andrew B. Shea,** to broader corporate responsibilities; **James H. Stebbins** and **John T. Whitely,** to chief and deputy chief, respectively, of South American, London, Pacific Coast, and New York operations; **Lucas A. Alden,** to chief of operations in Peru, Ecuador, Chile, and Bolivia; and **Fred R. Feuss,** to controller of the company.

George H. Fremon has been appointed patent coordinator for Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y. With the company since 1937, he has done developmental work on vinyl polymerization techniques and on synthetic acrylic fibers.

Hans Beller has been named manager of the new Calvert City, Ky., acetylene products plant of General Aniline & Film Corp., New York, N. Y. Dr. Beller, associated with the company since 1941, holds 25 U. S. patents and more than 50 foreign patents in organic chemistry and electronics.

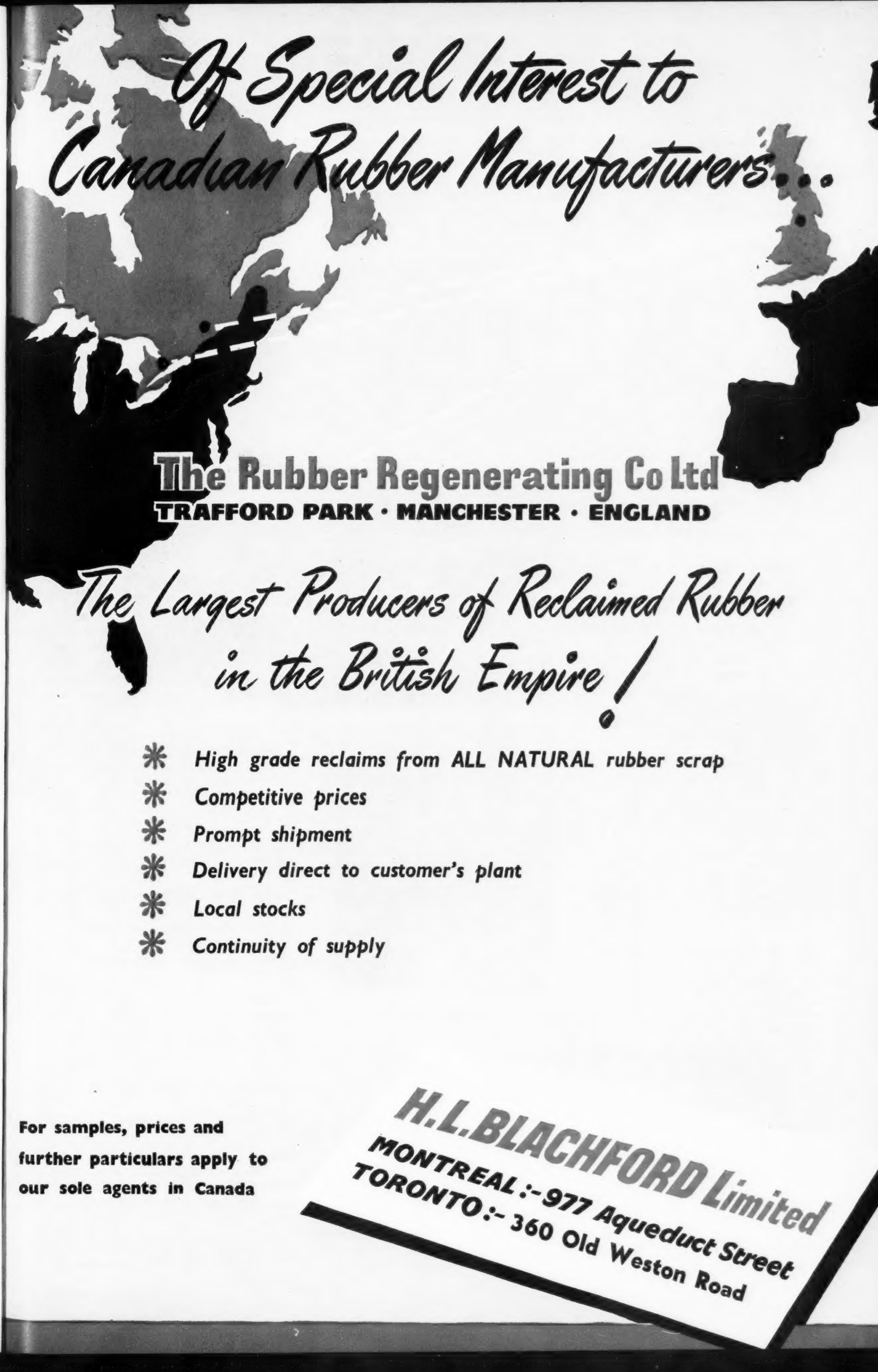
John M. Bradley has been promoted to administrative assistant to the vice president and manager of the carbon black division of Cabot Carbon Co., Pampa, Tex., a subsidiary of Godfrey L. Cabot, Inc., Boston, Mass.

Harry Weist

Fred C. Fernald

William E. Ford

William E. Ford has joined the carbon black sales department of Columbian Carbon Co., New York, N. Y.


Of Special Interest to Canadian Rubber Manufacturers . . .
The Rubber Regenerating Co Ltd
TRAFFORD PARK · MANCHESTER · ENGLAND
The Largest Producers of Reclaimed Rubber in the British Empire!
* High grade reclaims from ALL NATURAL rubber scrap
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* Continuity of supply
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H. L. BLACHFORD Limited
MONTREAL :- 977 Aqueduct Street
TORONTO :- 360 Old Weston Road

Robert S. Aries, president, R. S. Aries & Associates, New York, N. Y., has been elected a fellow in the New York Academy of Sciences in recognition of his contributions toward the advancement of science.

Francis W. Burger has joined the rubber chemicals division of Phillips Chemical Co., Bartlesville, Okla., as technical sales representative for the eastern sales district, with headquarters in Providence, R. I. He was formerly chief chemist, Kleistone Rubber Co., Warren, R. I.

F. E. Richardson

Francis W. Burger

Paul A. Tudder

Howard Erwin

F. E. Richardson has been advanced to assistant manager of the Memphis plant of Velsicol Chemical Corp., Chicago, Ill., manufacturer of rubber processing ingredients and other chemicals. He was formerly chief engineer at the Memphis facilities.

Robert Grant, vice president of The Standard Products Co., Cleveland, O., has been named operations manager of the firm and will be succeeded as manufacturing manager by **Wilbur C. Nordstrom,** formerly manager of the company's Reid Division. **F. R. Valpey,** senior vice president has been named chairman of the management policy committee. Newly named to this committee are **Beecher B. Cary,** director of research and engineering, and **Charles C. Hammer,** treasurer.

Miss Rita Connolly has joined the infrared laboratory staff of Electrical Testing Laboratories, Inc., New York, N. Y., as spectroscopist. She was formerly with the Sloan-Kettering Institute for Cancer Research. Electrical Testing Laboratories is now in a position to furnish infrared analyses for a variety of fields, including chemical, plastics, natural rubber, and synthetic elastomers, the company announces.

Charles A. Heiberger has been transferred to the Central Research Laboratory of Food Machinery & Chemical Corp., Nitro, W. Va., where he will serve as manager of the plastics and polymers department, chemical divisions. He will be succeeded as research director of the company's Ohio-Apex Division by Paul E. Willard, formerly assistant director of research.

R. Wolcott Hooker, vice president, Hooker Electrochemical Co., Niagara Falls, N. Y., has been elected president of the Synthetic Organic Manufacturers Association, succeeding **Samuel Lenher,** vice president, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Elected first vice president of the Association was **John H. Hilldring,** president, General Aniline & Film Corp., New York, N. Y.

Howard Erwin, former deputy director of the Office of Synthetic Rubber, has been appointed manager of the Paramount, Calif., plant of Midwest Rubber Reclaiming Co., East St. Louis, Ill. Before joining the government's synthetic rubber program, Mr. Erwin had been associated with The Goodyear Tire & Rubber Co., serving first as laboratory and chemical engineering technical superintendent in the firm's Los Angeles GR-S plant until its closing in 1949, then as rubber and paint technical salesman for the company's chemical division. He subsequently became plant manager for Kentucky Synthetic Corp.

Paul A. Tudder has joined the technical service department of the Mapico Color Division of Columbian Carbon Co., Trenton, N. J.

Charles C. Koza has been assigned to the advertising and sales promotion department of B. F. Goodrich Chemical Co., Cleveland, O.

Lawrence E. Nielsen has been named a senior scientist at Monsanto Chemical Co., St. Louis, Mo. Dr. Nielsen, with Monsanto since 1945, has guided a research program dealing with the mechanical properties of polymers and their relation to molecular structure.

Raymond Stevens, senior vice president, Arthur D. Little, Inc., Cambridge, Mass., has been chosen to receive the 1956 Gold Medal of The American Institute of Chemists, New York, N. Y., for his "contributions to the wider understanding of essential procedures for the management and operation of industrial research."

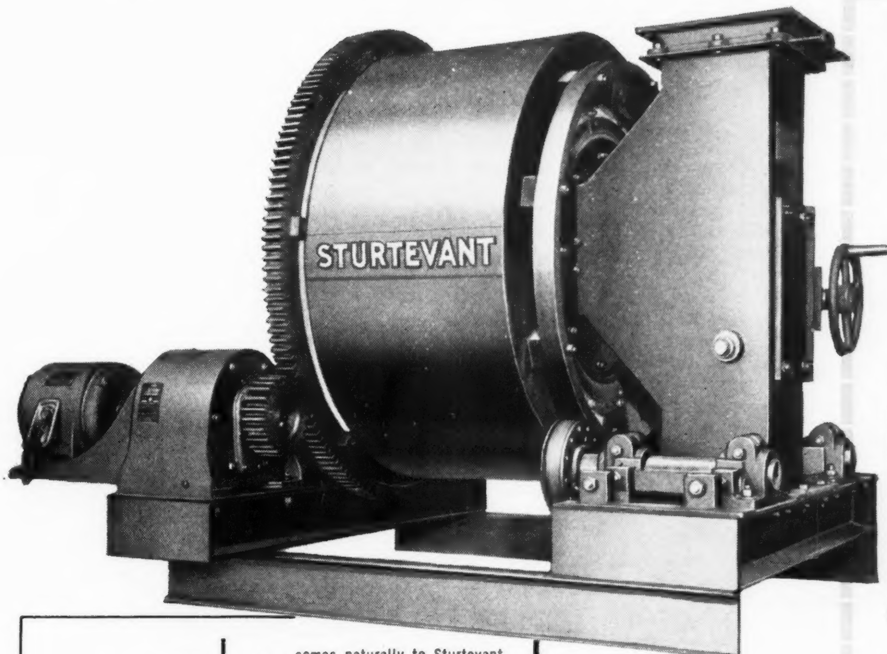
Paul R. Stadlman and **L. R. Yancey** have been named assistant division manager and budget supervisor, respectively, of the Des Moines division of Armstrong Rubber Co., West Haven, Conn.

James H. Begley has been advanced to western division sales manager for industrial chemicals for Stauffer Chemical Co., New York, N. Y.

Edward F. Devlin has joined the physics and electronics section, research division, The Goodyear Tire & Rubber Co., Akron, O.

Lawrence J. Halderman, an executive of The Timken Roller Co., Canton, O., has been appointed to serve a six-month term as director of the general components division of the Business & Defense Services Administration of the United States Department of Commerce, Washington, D. C.

COSTS OF BETTER BLENDS CUT TWO TESTED WAYS



ENGINEERING BLENDING AND OTHER DRY PROCESSES TO SPECIFICATIONS

. . . comes naturally to Sturtevant Engineers. They have a tradition of solving dry-processing problems since 1873. Sturtevant custom-built equipment and plants are well-known for their low-maintenance-cost operation. If your problems include any of the processes listed on the coupon, it will pay you to investigate.

Sturtevant Dry-Batch Blenders:

1. **SPEED UP PRODUCTION WITH 4-WAY MIXING**
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Batches from 500 to 40,000 pounds come out of Sturtevant Dry-Batch Blenders exactly as you want them. They are completely blended regardless of the varying weights, densities or fineness of the different ingredients. And no dust is lost in the process.

Four different vertical and lateral mixing actions inside the sealed rotating drum achieve thorough blending in minimum time. Single lever control of a single gate speeds up loading and discharging.

"Open - Door" accessibility makes cleaning and maintenance a matter of minutes. This original Sturtevant advantage plus 75-year-tested rugged construction assures more output per machine-year. Check the coupon for more information.

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Dry Processing Equipment

The "OPEN-DOOR" to *lower* operating costs over *more* years

CRUSHERS • GRINDERS • MICRON-GRINDERS • SEPARATORS
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My dry-process materials are: ____

Desired capacity is: ____

Name ____

Firm ____ Title ____

Street ____

City ____ Zone ____ State ____

W. I. Galliher, vice president of sales and director for Columbia-Southern Chemical Corp., Pittsburgh, Pa., has retired and will be succeeded as vice president of sales by **Chris F. Bingham,** formerly director of sales. Also advanced were **H. W. Gleichert, W. F. Newton,** and **P. A. Fodor, Jr.,** to vice president for market research and development, director of sales, and assistant director of sales, respectively.

Thomas Kerr, Jr., and **John B. Emack, Jr.,** have been advanced to western and eastern sales managers, respectively, for the Airfoam division of The Goodyear Tire & Rubber Co., Akron, O.

James E. West and **E. T. Thompson, Jr.,** have been advanced to sales managers in the Los Angeles and St. Louis branch offices, respectively, of the fibrous and industrial trades tape division of Minnesota Mining & Mfg. Co., St. Paul, Minn.

Mrs. Gloria D. Wathen has joined the physics and electronics section, research division, of The Goodyear Tire & Rubber Co., Akron, O.

George E. and Robert W. Carlson

George E. Carlson has been elected president and secretary of Minnesota Rubber & Gasket Co., Minneapolis, Minn., and **Robert W. Carlson** has been named vice president and treasurer.

Fred R. King, formerly of the Airfoam development department of The Goodyear Tire & Rubber Co., Akron, O., has been assigned to the rubber and plastics compounding section of the research division.

News Briefs

Phillips Chemical Co., Bartlesville, Okla., has announced an additional expansion of its Plains synthetic rubber facilities near Borger, Tex.

"Synthetic rubber capacity will be increased by 30,000 long tons annually, and annual capacity of the adjacent butadiene plant will be raised by 24,000 short tons," the company says.

Stauffer Chemical Co., New York, N. Y., is installing new mixing and other machinery valued at $125,000 at the Los Angeles, Calif., plant of its Western-Pacific Container Division, where compression molded rubber and plastic products are made.

Hobbs Mfg. Co., Worcester,. Mass., has moved its New York area office to 821—18th Ave., Irvington, N. J., which is under the direction of George E. Mansfield.

Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y., has advanced E. L. Meadows, formerly manager of the Newark district sales office, to supervisor of marketing information services, in which post he will organize a marketing information center for the company.

Pennsylvania Industrial Chemical Corp., Clairton, Pa., has opened two new warehouses in California, in Los Angeles and San Francisco, and will direct all its warehouse activities on the West Coast from its district sales office at 3460 Wilshire Blvd., Los Angeles.

Burgess Pigment Co., Sandersville, Ga., manufacturer of clays and pigments, has completed the installation of new facilities and equipment, doubling the production capacity of its plant. An improved whitening agent, Iceberg K, for use in the rubber and plastics industries, particularly adapted as an extender for titanium dioxide, has recently been added to the company's line of products.

Monsanto Chemical Co., St. Louis, Mo., has begun production of tertiary-butylamine at its recently completed Texas City, Tex., plant, flexibly designed for turning out a variety of alkyl amines, which are intermediates in the production of such compounds as emulsifiers, film-forming agents, and polishes.

National Starch Products, Inc., New York, N. Y., has opened a new plant at Plainfield, N. J., for the production of rubber and other solvent adhesives.

Koppers Co., Inc., Pittsburgh, Pa., plans a 40% production increase at its Petrolia, Pa., plant, where resorcinol, a material used in the treatment of tire cord, is manufactured.

Carbide & Carbon Chemicals Co., New York, N. Y., has received the American match industry's "Joshua" award for distinguished use of match book advertising. Company Vice President E. E. Fogle accepted the scroll from the match industry representative, Monroe Greenbaum.

The Goodyear Tire & Rubber Co., Akron, O., has produced its 675 millionth pneumatic tire, and its 25 millionth in the past eight months, both claimed to be world records for a single company.

"It took 17 years for Goodyear to build its first 25 million units," Chairman of the Board P. W. Litchfield observed.

Ferro Corp., Cleveland, O., has begun a $240,000 building and equipment expansion program in its color division, manufacturer of colorants for the rubber textiles, plastics, paint, and ceramic industries.

Whittaker, Clark & Daniels, Inc., New York, N. Y., has introduced a diamond powder compound for industrial abrasive use called Diadem, which is available in seven standard micron ranges and is marketed in polyethylene tubes.

The Dayton Rubber Co., Dayton, O., will publish a periodic series of bulletins on tubeless truck tires for distributor personnel that will deal with such topics as industry progress, pricing, valves, loads and inflations, mounting and demounting, inventories, and repairs.

Engineers Joint Council, New York, N. Y., will publish an Engineering Societies Directory, a complete listing of U. S. engineering societies and pertinent information about them. The Directory, said to be the first of its kind, will be available June 1, 1956.

Pennsylvania Industrial Chemical Corp., Clairton, Pa., has opened a new warehouse at the Jefferson Terminal, Detroit, Mich.

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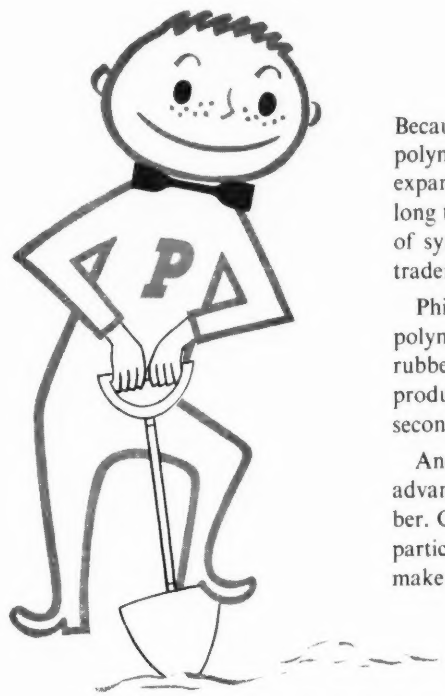
Boosts Butadiene Output

Petroleum Chemicals, Inc., will boost its butadiene production at its Lake Charles, La., plant from a current 63,000 tons annually to 79,000 tons in a $4,350,000 expansion program now under way, it has been announced by F. M. Simpson, vice president and general manager. The new production quota is expected to be in operation by next fall.

Petroleum Chemicals is jointly owned by Continental Oil Co., Houston, Tex., and Cities Service Co., Bartlesville, Okla. The formerly government-owned Lake Charles facility was purchased for approximately $17,500,000.

We're Expanding Our Plant

to make more Philprene®

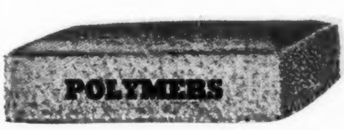


Because of greatly increased customer demand for our polymers and masterbatches, Phillips has launched an expansion program to provide an additional 20,000 long tons annually of the more than 20 different types of synthetic rubber materials bearing the PHILPRENE trademark.

Phillips will expand the capacity of its Plains copolymer plant by 37 per cent to meet the growing rubber needs. A substantial portion of this additional production is expected to become available in the second half of 1956.

And remember—you have at your disposal the full advantages of our long experience and research in rubber. Consult our Technical Representative about your particular rubber needs. We like to help our customers make better products . . . and better profits.

Each is comparable to former GR-S with the same numerical designation except 1605 and 1803 as noted below.

CURRENT PHILPRENES	HOT	COLD	COLD OIL EXTENDED
	PHILPRENE 1000 PHILPRENE 1001 PHILPRENE 1006 PHILPRENE 1009 PHILPRENE 1010 PHILPRENE 1018 PHILPRENE 1019	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503 NOTE: PHILPRENE 1019 AND 1503 ARE ESPECIALLY DESIGNED FOR THE WIRE AND CABLE INDUSTRY	PHILPRENE 1703 PHILPRENE 1706 PHILPRENE 1708 PHILPRENE 1711 PHILPRENE 1712
	PHILPRENE 1100 PHILPRENE 1104	PHILPRENE 1600 PHILPRENE 1601 PHILPRENE 1602 PHILPRENE 1605* *Philblack A cold rubber masterbatch	PHILPRENE 1803 similar to GR-S 1801 but incorporating 25 parts Philrich 5

PHILLIPS CHEMICAL COMPANY

Rubber Chemicals Division

318 Water Street, Akron 8, Ohio

Phillips 66

Obituaries

Edward D. Youmans

Edward D. Youmans, vice president in charge of research and product development for The Okonite Co., Passaic, N. J., and associated with the firm for 42 years, died of a heart attack at his Passaic home, December 18.

He was born in Garnersville, N. Y., in 1897.

He attended Brooklyn Polytechnic Institute and joined Okonite in 1913 as a laboratory assistant. He advanced to technical manager in 1928, vice president and technical director in 1943, vice president in charge of manufacturing and research in 1951, and was elected a director in 1952.

Throughout his career he worked on the development of insulated wires and cables, particularly in the adaptation of synthetic rubber-like materials to them. He participated in the preparation of standards for the National Electrical Manufacturers Association, the American Society for Testing Materials, and the American Standards Association. He served as chairman of many committees of these organizations and with the National Electrical Code.

During World War II, Mr. Youmans worked with the WPB Rubber Director's office, the United States Navy, and on the conservation of natural rubber and the development of synthetic rubber. He also served as technical director on wire and cable in the WPB's copper branch.

The deceased was the author of articles for numerous technical and trade journals and was a contributing author to the "Encyclopedia of Chemical Technology."

He held memberships in the Division of Rubber Chemistry of the American Chemical Society and the International Association of Electrical Inspectors, and was immediate past president of the Montclair (N. J.) Society of Engineers.

Mr. Youmans is survived by his wife, two daughters, a son, and three grandchildren.

Herbert S. Waters

Herbert S. Waters, vice president of The Dayton Rubber Co., Dayton, O., and in charge of the company's Koolfoam retail sales division, died December 6 at his home in Montclair, N. J., after an illness of several months. He was 54.

Associated with the company since 1949, Mr. Waters is widely credited as being one of the men most responsible for the current popularity of foam rubber pillows. The first zippered cover for foam pillows was introduced by him. Previously the pillows had been sold primarily as a specialty item for allergy sufferers.

Upon his graduation from the United States Military Academy in 1924, Mr. Waters entered the department store merchandising field and served with such concerns as Associated Dry Goods Corp., James McCreery & Wm. Hengerer Co., and the Newark branch of Kresge Department Store, of which he was vice president and sales manager for ten years.

He joined the banking firm of Lehman Bros. in 1943 as merchandising consultant and became associated with Dayton in 1949.

Mr. Waters held membership in the Sales Executive Club of New York and the West Point Society.

He is survived by his wife, his mother, a son, two daughters, and two brothers.

James E. Power

James E. Power, recently retired manager of national accounts and trade relations for the mechanical goods division of United States Rubber Co., New York, N. Y., died suddenly on December 17 in Asheville, N. C. He was 65.

Mr. Power joined U. S. Rubber in 1906 as an office boy, became manager of the New York branch of the mechanical goods division in 1926, then assistant manager of all branches of the division, eastern district sales manager, and finally manager of national accounts in 1949, a position he held until his retirement.

He held memberships in the Metropolitan Club, the New York Athletic Club, and the Masonic order. During World War I the deceased served in the Navy.

He is survived by his wife, a son, two daughters, and two sisters.

Services were held December 21 at St. Luke's Episcopal Church, Forest Hills, L. I. Burial was private.

Robert W. Anderson

Robert W. Anderson, in charge of customer relations for the Pliofilm sales department of The Goodyear Tire & Rubber Co., Akron, O., died suddenly November 18 at his home in Massillon, O.

Mr. Anderson joined Goodyear in 1932 and later held various posts in Marion, O.; Buffalo, N. Y.; Pittsburgh, Pa.; and Salem, O., where he was a store manager. In 1945 he became a Pliofilm analyst, moving to Pliofilm sales representative in 1949, and to departmental customer relations head in 1952.

The deceased was born in Columbus, O., 53 years ago. He attended the local schools and Ohio State University.

He held membership in the Lions Club, the Masons, and the Presbyterian Church, and was active in Boy Scout work.

He is survived by his wife.

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Consolidated Chemical Industries, Inc., San Francisco, Calif. First nine months, 1955: net profit, $3,243,462, equal to $9.27 a share, contrasted with $2,775,949, or $7.93 a share, in the 1954 months; net sales, $26,504,856, against $23,078,556.

Financial

American Viscose Corp., Philadelphia, Pa. Nine months ended September 30, 1955: net profit, $18,315,000, equal to $4.29 a common share, contrasted with $6,116,000, or $1.30 a share, in the like period last year; net sales, $195,652,000, against $156,219,000.

American Zinc, Lead & Smelting Co., Columbus, O., and wholly owned subsidiaries. Nine months ended September 30, 1955: net profit, $1,584,391, equal to $1.34 a common share, against $1,264,795, or $1.07 a share, in the 1954 months; net sales, $57,518,776, against $45,392,035.

Armstrong Cork Co., Lancaster, Pa. Nine months to September 30, 1955: net earnings, $11,179,000, equal to $2.18 a common share, compared with $9,354,000, or $1.94 a share, in the corresponding months of 1954: net sales, $186,613,000, against $163,642,000.

The Armstrong Rubber Co., West Haven, Conn., and wholly owned subsidiaries. Year ended September 30, 1955: consolidated net earnings, $2,734,133, equal to $4.95 each on 547,715 common shares, compared with $1,669,458, or $4.02 each on 403,107 shares, in the preceding fiscal year; net sales, $68,981,866 against $55,376,084; federal income taxes, $2,594,000, against $1,743,795; current assets, $28,836,504, current liabilities, $14,522,252, against $23,675,401 and $9,076,164, respectively, on September 30, 1954.

Borg-Warner Corp., Chicago, Ill., and subsidiaries. January 1-September 30, 1955: net income, $26,076,149, equal to $3.29 a common share, compared with $14,052,304, or $1.89 a share, in the like period last year; net sales, $405,798,190, against $281,706,158.

Celanese Corp. of America, Charlotte, N. C. First nine months, 1955: net income, $8,695,105, equal to 88¢ a common share, contrasted with $3,940,456, or 7¢ a share, in the prior year's period; net sales $132,358,391, against $105,361,648.

Columbian Carbon Co., New York, N. Y., and subsidiaries. Nine months ended September 30, 1955: net profit, $4,443,326, equal to $2.76 each on 1,612,218 capital shares, against $3,256,068, or $2.02 a share, in the 1954 months; sales, $48,854,715, against $38,721,240.

Mansfield Tire & Rubber Co., Mansfield, O. First nine months, 1955: net earnings, $1,344,504, equal to $2.30 a share against $849,315, or $1.54 a share, a year earlier.

(Continued on page 572)

News from Abroad

Malaya

RRIM's Superior Processing Rubber

A new type of natural rubber has been developed by the Rubber Research Institute of Malaya[1] which gives compounds with much better extrusion and calendering characteristics than regular grades of natural rubber and which, it is hoped, will enable natural rubber to be used in fields preempted by plastics and synthetic rubbers.

Called Superior Processing Rubber, it is prepared from a mixture of four parts of field latex and one part of vulcanized latex which has been passed once through a centrifugal clarifier to remove excess vulcanizing ingredients. According to a description of the method of preparation, a vulcanizing suspension, which must be ground for 36 hours in a ball mill, is prepared according to the following formulation:

	Lbs.
Sulfur	18.0
Zinc oxide	13.5
Sodium diethyldithiocarbamate	1.8
Mercaptobenzothiazole	3.6
Turkey red oil	0.036
Pearl glue	1.8
Phenol	0.036
Water	35.128

Fresh latex is strained into a reaction tank and ammoniated to 0.3%. The dry rubber content is estimated, and 8.2% of the vulcanizing suspension on the weight of the rubber is stirred into the latex; it is heated to 180°F. in one hour, held at 180-185°F. for two hours, and tested. The vulcanized latex is cooled, centrifuged, and diluted to 20% solids. New fresh field latex, without preservative, is diluted to 20% solids and blended with the vulcanized latex in the proportions given above. The mixture is then coagulated with about 1% of formic acid and machined to crepe or sheet in the normal manner.

The advantages claimed for SP rubber over ordinary crepe or sheet, which are particularly notable in lightly loaded mixes, are that SP rubber more quickly forms a smooth band on a heated two-roll mill and on removal retains a much greater proportion of its original dimensions; extruded articles retain their shape better; calendered sheet and extrusions have smooth surfaces; and extrusions of "pure gum" stocks can be made from SP rubber. The rate of extrusion can be considerably increased because the same finished diameter is obtained from a larger aperture die. More highly loaded compounds give the same advantages as the lightly loaded mixes. Vulcanization is accompanied by a slight shrinkage in the dimensions of the finished article on cooling, but this is said to be less than for ordinary crepe and sheet.

SP rubber enables articles to be manufactured of natural rubber, such as thin walled tubing and high-grade rubber covered wire, which previously had to be made from plastics in order to obtain a smooth surface and accurate dimensions.

The direct cost of production of SP rubber above the cost of manufacture of pale crepe is put at 1.765 cents (Straits currency) per pound, but this does not include supervision, testing, maintenance, depreciation, etc., or the extra cost of wrapping in special covers.

The RRI Experimental Station has been producing SP rubber at the rate of two tons monthly; it has been sold in Britain at a premium of 2d. per pound over pale crepe, and since demand is exceeding supply, the RRI is drawing attention of producers to the possibilities of commercial production of SP rubber in Malaya. The process is patented, but license to manufacture is obtainable from RRIM.

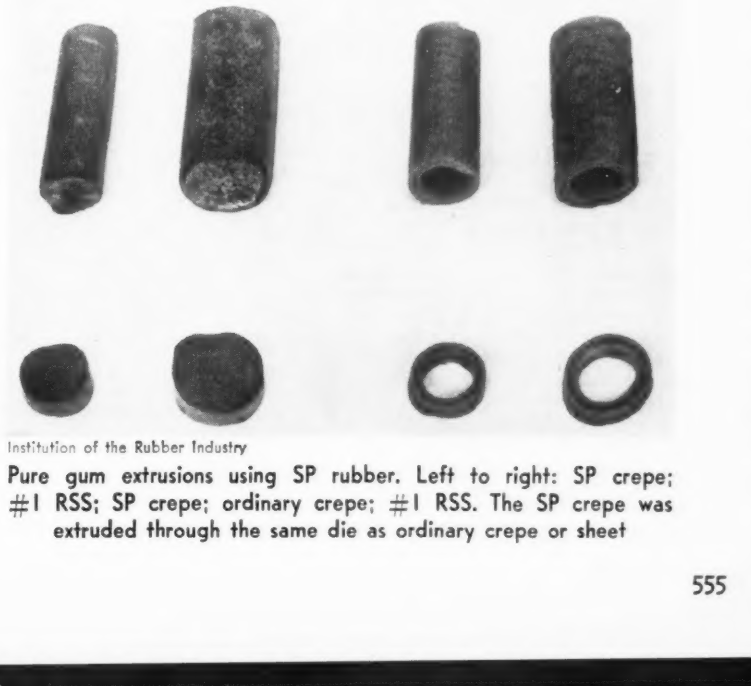
Objections Voiced to U.K. Synthetic Use

Malayan rubber producers have been considerably perturbed by reports on the growing interest in synthetic rubber in the British Isles. One source stated that British rubber manufacturers who used an estimated 24,000 tons of synthetic rubber in 1955, intend to buy 70,000 tons in 1956. Asiatic spokesmen for the Malayan rubber industry bluntly criticized the proposal as a threat to the rubber industry and the economy of Malaya. A particularly sore spot is that the United Kingdom would be using millions of American dollars, largely earned by the natural rubber industry in Malaya, to pay for the very imports of American synthetic rubber which would cut natural rubber consumption by a corresponding tonnage.

An important local rubber man considered it would be "outrageous" of the British Government to "fritter away" the American dollars in this manner. The chairman of the Malayan Estate Owners' Association urged the Federation Government, the Colonial Office, and the United Kingdom Government, to take steps to guard Malaya against this threat from synthetic rubber. He realized, he said, that synthetic rubber was superior to natural rubber for certain purposes, but, he insisted, Britian has the inescapable duty of furthering the cause of natural rubber.

In the *Malay Mail,* November 15, it was pointed out that the Malayan industry would be most vulnerable in the next few years when it would be replanting. Until the new trees came into production, little could be done to cut costs to meet synthetic rubber competition, once the present world shortage was over, and price was again the deciding factor. The synthetic rubber industry, it urged, must not—if it could be helped—be allowed to expand unchecked.

About the same time it was learned that Dunlop Rubber Co., Ltd., in England, had started construction, at a cost of almost £500,000, of an experimental plant to produce different types of synthetic rubber on an industrial scale. The plant, with maximum annual capacity of 2,000 tons, will make use of the knowledge gained during several years' operation of a small pilot plant. A later announcement stated that Dunlop had formed International Synthetic Rubber Co., Ltd., with initial ordinary



Institution of the Rubber Industry

Pure gum extrusions using SP rubber. Left to right: SP crepe; #1 RSS; SP crepe; ordinary crepe; #1 RSS. The SP crepe was extruded through the same die as ordinary crepe or sheet

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[1] *Planters Bulletin* of the RRIM, Nov., 1955, p. 98.
Rubber Developments, British Rubber Development Board, London, England, Autumn, 1955, p. 70.

share capital expected to amount to £4,000,000, to produce general-purpose synthetic rubber.

Synthetic Costs vs. Natural Rubber Costs

Referring to the (above) report on Dunlop's experimental synthetic plant, the Chief Replanting Officer, A. C. Smith, called attention to the relative positions of natural and synthetic rubber with regard to capital costs. With plant costing £500,000 and output capacity at 2,000 tons, the capital cost per ton of synthetic rubber is £250. The average cost of replanting an estate, Mr. Smith estimates at £100 per acre, and he considers it doubtful whether a large new estate could under present conditions be started from scratch for less than £150 per acre.

An estate replanted with the best stock available in accordance with the best modern practice, or newly set up along similar lines, is not likely to yield as much as half a ton of rubber an acre a year. No estate has yet reached that yield over the whole acreage for years on end, he emphasizes and adds that "statements by chairmen of rubber companies, quoting very high figures for 'yield per acre tapped,' are smokescreens." A rubber grower who has brought into production an estate planted with high-yielding material, he explains, can reasonably expect very high yields for a period of years, but he will also have to expect a period of years when yields decline until replanting becomes necessary, succeeded by a period of several years when—pending maturation of the replanted area—there will be no yields at all from it.

But while the advantage of capital cost seems to be lost to the rubber grower, yet by greatly increasing yields, he still has a better possibility of reducing costs, by say 33%, than the synthetic rubber producer, Mr. Smith believes, and once more calls on the rubber industry to replant and to do so quickly. Synthetic plants, he warns, can probably be brought into operation in less than a few years, but there is no short cut for natural rubber, which requires not much less than seven years under the best conditions.

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Russia

Vulcanizing Investigated with Radioactive Sulfur

Quantitative analyses of the vulcanizing process were undertaken by S. E. Bressler, W. J. Prjadilowa, and W. Ja. Chainman[1] to help explain (1) why only sulfur and not another bridging element can yield useful vulcanizates; (2) the relation between free and bound sulfur, as well as the nature and mechanism of addition of bound sulfur to the rubber macromolecule; and (3) the kinetics of the vulcanizing process. In these investigations radioactive sulfur was used with the aid of which diffusion measurements were carried out.

Diffusion or solubility of sulfur in natural and synthetic rubbers was determined on disks 30 millimeters in diameter and 0.5 to 2 millimeters thick, to one side of which 0.01 to 0.02% of radioactive sulfur was applied; measurements were made on the opposite side with a Geiger counter.

In the case of natural rubber, it was shown that in the absence of accelerators no bridging takes place, and both sides of the disks gave the same sulfur concentration. However, if 0.3 to 0.5% thiuram or thiazole type is added, there is only partial diffusion. The remaining sulfur is irreversibly bound; the quantity of bound sulfur is directly proportional to the quantity of free sulfur. With higher concentrations of sulfur, however, this is no longer the case, and it is assumed that here a secondary bridging process is superimposed on the first, an assumption which could be confirmed by examining diffusion in the presence of accelerators and of up to 3% sulfur.

In the case of Buna rubber, on the other hand, addition of sulfur is independent of the sulfur concentration, and there is no secondary addition. From an analysis of these results it was concluded that the solution and diffusion of sulfur constitute the first stage in the vulcanizing process.

Fundamental conclusions on the structure of the sulfur diffusing in the rubber were drawn from a consideration of the diffusion constant obtained. The equivalence of the constants found for the rate of sulfur addition to the rubber and the exchange reaction between elementary sulfur and thiuram-type accelerator suggested that the cooperation between the two is the principal process determining rate of vulcanization. It was assumed that monomolecular splitting of the thiuram accelerator into radicals is the first stage in both reactions. The tests indicated that only two sulfur atoms of thiuram accelerator (evidently those of the disulfide group, -S-S-) participated in the exchange reaction with S^{35}. This reaction leads to a thermodynamically unstable, active sulfur bi-radical S_2 which adds to the rubber.

It was shown that with less than 0.1% sulfur, linear addition plays the main role; in industrial procedures, with 2% to 5% sulfur, the secondary addition—which occurs at points where primary addition has already taken place—is very important. It is assumed that after addition of -S-S-, these points also exhibit the properties of a very active radical and are capable of splitting the ring-shaped S_8 molecules into bi-radicals, which, in turn, are capable of finally linking together two hydrocarbon points activated by primary addition.

Hence it is considered that the formation of sulfur bridges takes place by recombination of polysulfide radicals, and that such bridges include 10 to 20 sulfur atoms. If polysulfide bridging occurs during the vulcanization of natural rubber, then (on the basis of the splitting energy) migration of a considerable part of the bound sulfur in the form of a chemical diffusion is to be expected; then the diffusion constant is smaller than that of the free sulfur. This assumption could be confirmed by tests with S^{35} at elevated temperature in an Argon atmosphere.

In the case of vulcanized Buna, diffusion was insignificant, which condition suggested that in this case the number of polysulfide linkages is small.

[1] *J. techn. Phys., Moscow-Leningrad*, 24, 577/598 and 2150/2168 (1954).

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East Germany

First Foam Rubber Plant

East Germany now has its first foam rubber factory. A branch of the Elguwa Rubber Works in Leipzig, it has already started production on seats for furniture and motor cycles, upholstery for automobiles, and mattresses from foam rubber made from Igetex supplied by the Buna Works in Schkopau.

Phenol-Containing Plasticizer Study

In view of the fact that the plasticizer, Kautschol, which contains about 45% free phenols, have a more pronounced hardening effect on rubbers than the usual plasticizers, it was assumed that this result was due to the presence of the phenols. G. Hofmann and I. Patzak, of the research and development section of VEB Gummi Werke "Elbe," Wittenberg, report[1] on tests carried out with a number of dihydric and trihydric phenols and phenyl ethers in unvulcanized and vulcanized Buna S3-Carbon Black P 1250 mixes, to study this effect.

It was found that a conspicuous property of the phenols—except hydroquinone —was their rehardening effect on unvulcanized mixes, an effect related to the number of hydroxyl groups present; plasticity increases with the increase in the number of these groups. In this regard phloroglucinol which for some reason still remains unexplained, formed a glaring exception.

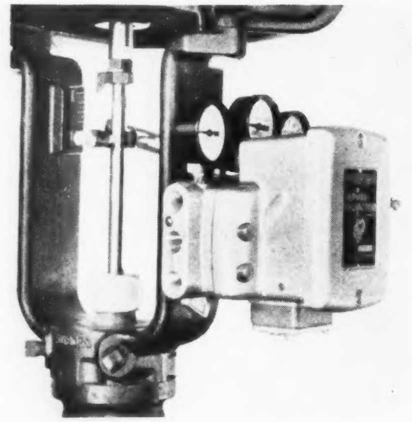
The position of the OH group in the nucleus and nuclear substituent is also very important, as demonstrated by hydroquinone to whose OH in p-position is ascribed the fact that it does not have the rehardening effect of the other phenols. Since rehardening is less marked in the case of the phenyl ether mixes than of the phenol mixes, it is thought that esterification of the OH groups reduces this action.

Vulcanized phenol-rubber mixes showed improved tensile and elongation values, though permanent set also increased, except with phenylethylphenol. Phenyl ethers reinforce vulcanizates without substantially influencing hardness, and since they also cause less rehardening in uncured mixes, these substances are to be investigated further, particularly those with longer alkyl side chains.

The above results are considered of both theoretical and practical interest as they permit a better evaluation of the usual commercial plasticizers, like Kautschol, and open up prospects for important developments.

[1] *Plaste u. Kautschuk*, 2, 6, 123 (1955).

NEW EQUIPMENT



Foxboro's Type C Vernier Valvactor

High-Accuracy Valve Positioner

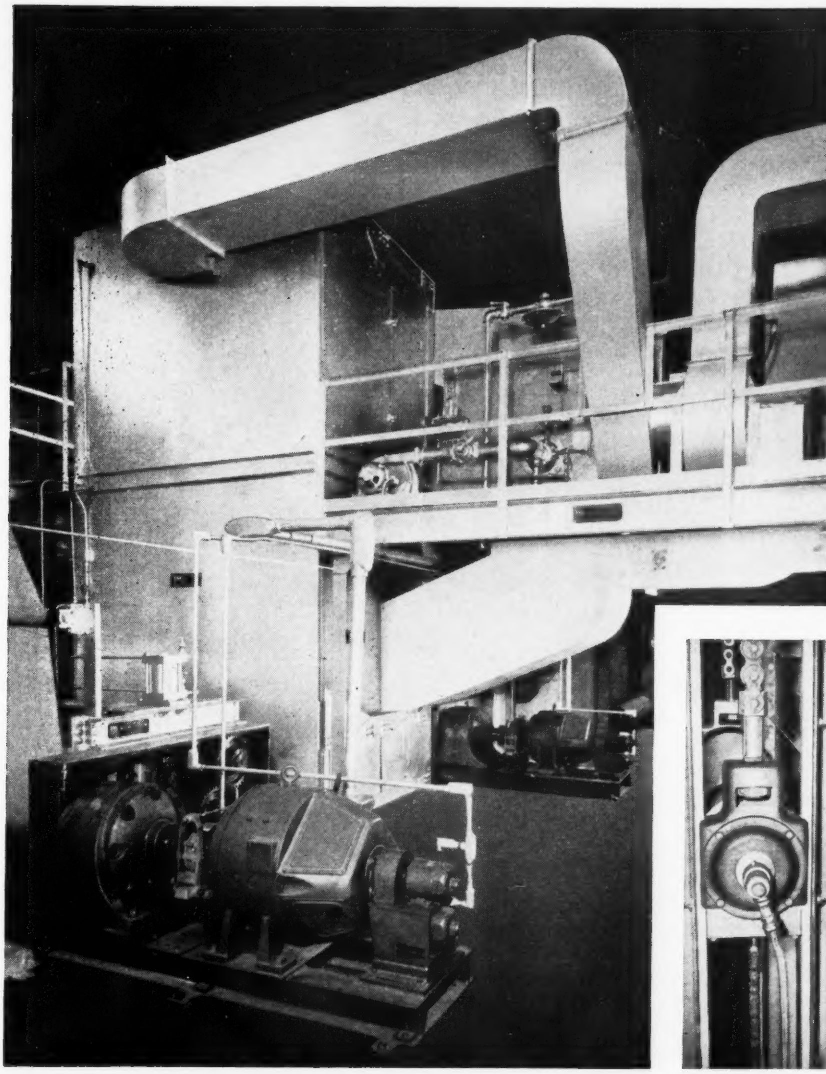
A valve positioner that overcomes friction and reduces line effects, speeding valve response to controller signal, and suggested for such applications as large-volume diaphragm motors and processes where controller-to-valve distances are long, has been introduced by The Foxboro Co., Foxboro, Mass. Called Type C Vernier Valvactor, the positioner, with gages and switch, has dimensions of 6⅜ by 6¼ by 5$^{5}/_{16}$ inches and mounts directly on valve yoke.

According to Foxboro, at the turn of a disk the positioner can be adapted to either air-to-lift or air-to-lower diaphragm motor. Simple field adjustment is said to permit valve sequencing. A three-gage and bypass manifold facilitates start-up and maintenance procedures.

Single-Plane Swivel Joints

A line of small-size single-plane swivel joints, designed for hydraulic or pneumatic service on pipe, tubing, or hose, has been announced by Barco Mfg. Co. The joints, in ball-bearing and thrust-bearing types suitable for pressures up to 2,000 psi., provide up to 360-degree rotation on machinery where flexible piping is required. These joints are equipped with O-ring seals and have low rotating torque at all pressures, according to Barco. The joint casing is machined from aluminum, and the rotating shaft from steel. Temperature range is given at —20 to 225° F. Standard

Barco single-plane swivel joint



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension **IOI** Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.

The Rollevator® roll automatically moves up and down within the oven, in direct relation to line speeds. Thus, at *any line speed, heat-exposure* time of the nylon is held *constant* at a constant temperature setting and at constant tension.

Rollevator® Oven* hot stretches nylon tire cord at constant optimum temperature, constant time and constant tension, at variable line speeds

The IOI Rollevator® Oven* is the answer to more uniform hot stretching of nylon with greater production efficiency. Simple and automatic in operation, it practically eliminates costly shutdown and repair time. When the line is stopped the Rollevator® roll automatically lowers out of the heat zone, eliminating the need for quick cool purging of the oven and the time and expense involved in reheating the oven when starting up again. Its low operating cost combined with low initial cost assures you of lower production cost. An IOI sales engineer will be glad to give you complete information about the Rollevator® Oven* and to discuss your requirements for any system from 3 to 100 yards per minute.

® Trade Mark Registered
*Pat. Applied For

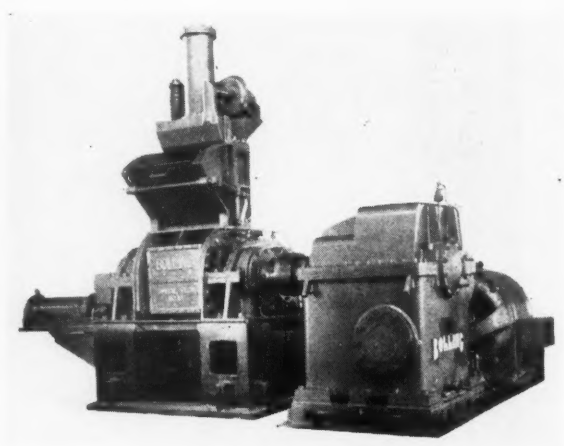
IOI ENGINEERING VERSATILITY

INDUSTRIAL OVENS, INC.

13813 TRISKETT ROAD CLEVELAND 11, OHIO

sizes of ¼-inch and ½-inch are offered, with the ⅜-inch and ¾-inch sizes available on quantity orders.

Catalog Sheet No. 406 may be obtained by addressing the company, Dept. J-36, 500 N. Hough St., Barrington, Ill.



Spiral-Flow intensive mixer No. 10 with 500 hp. drive

Stewart Bolling Rubber, Plastics Mixers

A line of mixers and drives for rubber and plastics compounding that is said to permit virtually automatic operation through time and temperature controls has been introduced by Stewart Bolling & Co., Inc., Cleveland, O. Called Spiral-Flow intensive mixers, they are available in chamber capacities of 231, 3,450, 5,100, 12,160, and 16,000 cubic inches and have such features as spiral flow sides that allow efficient heating or cooling, easily accessible split end frames, rotors with full-circle end flanges, and anti-friction bearings, according to the company.

Stewart Bolling lists the following advantages for these mixers: less power consumption, with end flanges running for life; faster mixing and dispersion from a new conception of helixes and balanced proportion; longer effective life; lower maintenance costs; and high accessibility.

Specifications of these mixers have been reported as shown in the table below:

Size of Machine	No. 0	No. 3	No. 4	No. 10	No. 12
Chamber capacity, cu. in.	231	3,450	5,100	12,160	16,000
Rubber capacity, lbs.					
Crude rubber	4½	65	90	235	300
1.25 gravity stock	5½	90	125	300	400
1.50 gravity stock	6½	105	150	350	460
Standard motor hp.					
Single-speed	—	75/100	125/150	200/250	300/400
Multiple-speed	25	—	—	—	—
Hp. super power units (high speed, high pressure)	—	—	300/400	400/600	600/800

An illustrated booklet describing these mixers is available from the company on request.

Small Machine Edge-Guide Control

A new model edge-guide control for small slitters, presses, laminators, and textile machinery has been introduced by Askania Regulator Co., Chicago, Ill. Designated Model 500, the control is said to be capable of handling any web material, including rubber, plastics, or textiles, and operates continuously while responding to a web position error of 0.005-inch. Heart of the control device is a sensing nozzle which expels a thin jet of low-pressure air in measuring the web position. The equipment is clog-proof and easily installed, according to the company.

NEW MATERIALS

Ohio-Apex Di-Isodecyl Phthalate Plasticizer

Di-isodecyl phthalate, a primary plasticizer for most resins that is said to impart permanent flexibility, good low-temperature flexibility, heat and light stability, low migration, low water extraction, and very good hand and drape, has been introduced commercially by Ohio-Apex Division, Food Machinery & Chemical Corp., Nitro, W. Va. The plasticizer performs especially well in vinyl compounds, the company says. It is insoluble in water and is insoluble or has limited solubility in glycerine, the glycols, and some amines, while being soluble in most other organic liquids, according to Ohio-Apex.

Some other reported properties are the following:

Molecular weight	446
Specific gravity @ 20° C./20° C.	0.966
Boiling range @ 4 mm.	230-254° C.
Freezing point	—50° C.
Flash point	219° C.
Viscosity @ 20° C.	108 centipoises
Vapor pressure @ 150° C.	0.02 mm. Hg.
200° C.	0.35 mm. Hg.
Surface tension @ 20° C.	29.3 dynes/cm.

Technical data sheets are available from the company on request.

Low-Temperature Vinyl Chloride Plasticizer

A low-temperature plasticizer for vinyl chloride and vinyl-chloride copolymer resins, also applicable as a softener for synthetic and natural rubbers, has been made commercially available by Carbide & Carbon Chemicals Co., New York, N. Y. Designated "Flexol" 10-A, the material, chemically didecyl adipate, is also said to impart to vinyl compounds low volatility, low specific gravity, and heat and light stability.

Applications include calendered film and sheeting, profile extrusions, dip coatings, slush moldings, and electrical insulation, and as a plasticizer for nitrocellulose.

Reported physical properties include the following:

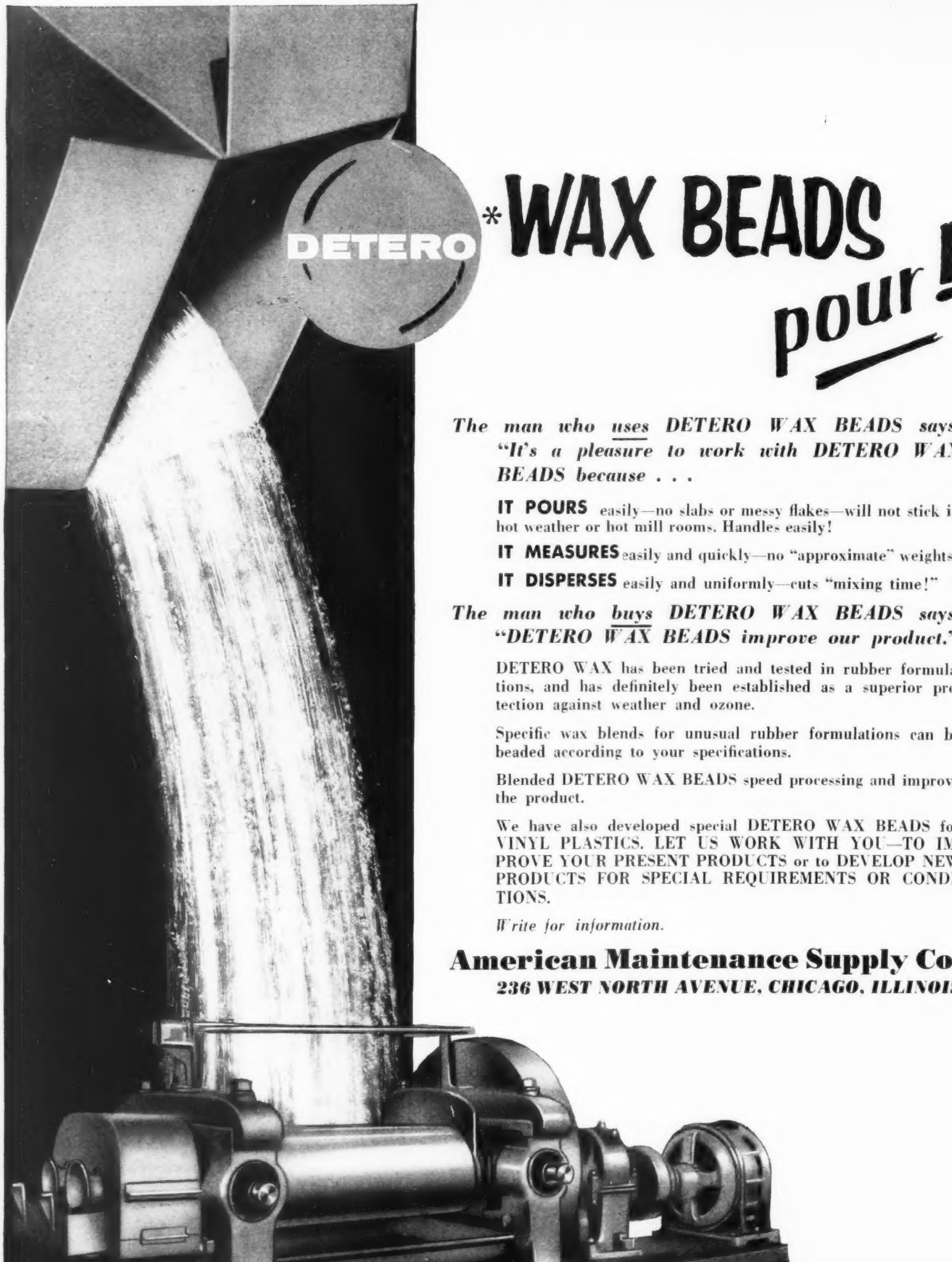
Specific gravity, 20/20° C	0.9181
Boiling point @ 5 mm. Hg.	245° C.
Vapor pressure, 200° C	0.58 mm.
Absolute viscosity, 0° C	73.9 cps.
20° C	26.3 cps.
40° C	12.2 cps.
Surface tension, 20° C	29.1 dynes/cm.
Solubility of water in @ 20° C	0.12% by weight

A bulletin describing "Flexol" 10-A, giving its performance in vinyl compounds and listing its compatibility in various materials, is available from the company.

High Tensile Strength Nitrex 2615

A nitrile rubber latex that is said to give very high tensile strengths when cured with zinc oxide at moderate temperatures and which is very resistant to a wide variety of solvents has been introduced by Naugatuck Chemical, Division of United States Rubber Co., Naugatuck, Conn. Called Nitrex 2615, the latex is also advantageous in having good color characteristics and low temperature flexibility; it forms an odorless film with desired flexibility, according to the company.

(Continued on page 566)


DETERO
*WAX BEADS
pour!
The man who uses DETERO WAX BEADS says. "It's a pleasure to work with DETERO WAX BEADS because . . .
IT POURS easily—no slabs or messy flakes—will not stick in hot weather or hot mill rooms. Handles easily!
IT MEASURES easily and quickly—no "approximate" weights!
IT DISPERSES easily and uniformly—cuts "mixing time!"
The man who buys DETERO WAX BEADS says. "DETERO WAX BEADS improve our product."
DETERO WAX has been tried and tested in rubber formulations, and has definitely been established as a superior protection against weather and ozone.
Specific wax blends for unusual rubber formulations can be beaded according to your specifications.
Blended DETERO WAX BEADS speed processing and improve the product.
We have also developed special DETERO WAX BEADS for VINYL PLASTICS. LET US WORK WITH YOU—TO IMPROVE YOUR PRESENT PRODUCTS or to DEVELOP NEW PRODUCTS FOR SPECIAL REQUIREMENTS OR CONDITIONS.
Write for information.
American Maintenance Supply Co.
236 WEST NORTH AVENUE, CHICAGO, ILLINOIS
Manufacturer's Representative
The C. P. Hall Company
Akron, Ohio • Newark, N. J. • Chicago, Ill. • Los Angeles, Cal.
* Process patent applied for.

TECHNICAL BOOKS

BOOK REVIEWS

"Neues Gummi Adressbuch 1955." Published by Curt R. Vincentz Verlag, Hannover, Germany, 1955. Cloth, 544 pages, 8½ by 6¼ inches. Price 32 D.M.

This second edition of the "New Rubber Directory," which makes its appearance four years after the first edition, includes as the title announces, the addresses of manufacturers of rubber and asbestos goods and those of related firms in the leather, plastics, cable and belting industries, as well as wholesalers and retailers, shops, suppliers of raw materials, importers, and agents, in the West German Federation and West Berlin.

The greater part of the volume is devoted to a geographical arrangement of the firms, in alphabetical order, with indications of their membership in the various organization and associations, and of their chief products; an alphabetical list of the firms, with their addresses, amplifies this section. In addition appear the addresses of the associations and organizations of the trades involved, and a buyers' guide, which includes trade marks and trade names.

The buyers' guide, with roughly 5,500 entries, is divided into two parts, of which Part I covers raw materials and semi-finished and finished goods. Part II deals with machinery, equipment, testing apparatus, etc., and includes the names of manufacturers of machinery and parts for the rubber and plastics industries who are members of the Association of German Machinery Enterprises; their specialties are indicated by letters and numbers which refer to a separate list classifying the machinery under five main groups covering 44 sub-divisions.

This directory thus offers much information which should prove useful to those interested in German production and trade in the branches covered.

"Chemical Engineering Catalog, 1955-56." Reinhold Publishing Corp., New York, N. Y. Cloth, 8½ by 11¼ inches, 1917 pages. Price, $12.50.

This fortieth annual edition of the catalog contains, as in the past, photographs, descriptions, and specifications of industrial equipment available through American manufacturers or dealers. The volume is sectionalized into six indices: company name, function of equipment, equipment and materials of construction, plants and specialized services, pilot-plant manufacturers, and trade names. More than 550 equipment manufacturers and their products are contained in this latest compilation.

NEW PUBLICATIONS

"Non-Black Tires." Ralph F. Wolf. Hi-Sil Bulletin No. 7. Columbia-Southern Chemical Corp., Pittsburgh, Pa. 8 pages. Recipes for making colored natural or synthetic rubber tire treads, using the firm's Hi-Sil 233 as the reinforcing agent, instead of conventional carbon black, are given in this bulletin. Physical properties of these base compounds after various curing times are also reported, as well as the results of wear tests on the finished colored tires. Suggested coloring materials are listed. Post-cure data of natural rubber carcass or sidewall-type compounds employing progressively lower loadings of Hi-Sil 233 conclude this publication.

"Safe Chlorine Handling and Storage." Diamond Alkali Co., Cleveland, O. This is a 17- by 23-inch wall chart providing 50 suggestions for the safe handling and storage of chlorine.

"Plasticizers." PRA-1155-8M. Ohio-Apex Division, Food Machinery & Chemical Corp., Nitro, W. Va. 72 pages. This handsomely designed catalog contains complete information on 32 of the company's plasticizers. Included are the formula, specifications, average properties, suggested uses, test data after incorporation in polyvinyl chloride and other resins and in rubbers and shipping data of each plasticizer. Also given are a general discussion of the uses of plasticizers in industry, a full explanation of standard testing methods, and summary tables of the properties of these plasticizers.

"Stearates." Bulletin No. 55-2. Witco Chemical Co., New York, N. Y. 36 pages. The composition, uses, and properties of 46 of the company's metallic stearates are contained in this booklet, together with analytical procedures for them, and government specifications.

Publications of Harwick Standard Chemical Co., Akron, O.:
"Synvaren PLS-R." Bulletin #12-198-0-10-55. 3 pages. Specifications and applicable recipes of Synvaren PLS-R, a "stopped" resorcinol-formaldehyde resin for use with latex in the treatment of rayon and nylon for subsequent adhesion to rubber, as in tire cord, V-belt cord, and hose and belt fabrics, are included in these data sheets.
"Synvaren 631 and Synvarite BRLD." Bulletin #12-171-3-10-55. 3 pages. Specifications and recipes of Synvaren 631 and its powdered form, Synvarite BRLD, water-soluble, phenol-formaldehyde resins for use in dip preparations to obtain adhesion between rubber and fabric, are given in these data sheets.

"Facts about Titanium." Arthur D. Little, Inc., Cambridge, Mass. 2 pages. The properties and fabricating methods of titanium and its alloys appear in this little folder.

Nitrex 2615

(Continued from page 562)

Suggested applications include moisture- and grease-resistant paper coating, as a paper saturant in masking tape, in paint roller fabric manufacture, and as a combining adhesive.
Some reported properties of Nitrex 2615 follow:

Solids, %	38 to 40
pH	7 to 9
Viscosity, Brookfield units	10 to 30
Average particle size	0.08 microns
Weight per gallon	8.3 lbs.
Solids per gallon	3.3 lbs., approx.

Technical data sheets, including compounding suggestions, are available from the company on request.

Oil-Resisting Stabilizing Plasticizer Estynox 308

A new epoxy-type stabilizing-plasticizer for such polymers as chlorinated and synthetic rubbers, polyvinyl chloride, cellulose acetate butyrate, nitrocellulose, and ethylcellulose has been introduced in pilot-plant quantities by Baker Castor Oil Co., New York, N. Y. Called Estynox 308, the material though stabilizing against heat and ultra-violet light, is said to differ from ordinary epoxidized oils by marked solubility in alcohols, higher viscosity, and greater resistance to gasolines, aliphatic solvents, and oils, owing to an acetoxy modification of its structure.
In oil-resistant synthetic rubber compounds, such as butadiene-acrylonitrile rubber, Estynox 308 is said to provide low oil and gasoline extraction, good heat resistance, and moderate low-temperature flexibility.
The plasticizer has a specific gravity at 25° C. of 1.015, a saponification value of 292, and an acid value of 4. Other physical and chemical properties have not yet been made available by the company.

MARKET REVIEWS

Natural Rubber

The natural rubber market was unusually stable during the period from November 16 to December 15, showing a high-low price differential of only 3¾¢ a pound on the New York spot market. Trading on the Commodity Exchange was equally off recent levels, subsiding to about the activity rate of last July.

Several factors apparently contributed to the market's temporary stability. The influence of ODM Director Flemming's statement in mid-November that the government's natural rubber stockpile would remain untouched cannot be ignored even now, stilling, at least for another year, periodic rumors as to its disposal.

One observer attributed the current stability to the relative lack of takers for lower grades of R.S.S. and for offgrades which, it was said, have been acting as a counterweight to the continuing pressure of unfulfilled orders for Ribbed Smoke Sheet #1, both here in the United States and abroad.

A third reason may be that some consumers expect natural rubber prices to fall and are holding aloof from the market until they do decline.

It is hard, however, to go along with such expectation of falling prices. Everyone acknowledges that natural rubber is in short supply, compared to booming worldwide production. The situation may very well worsen during the first months of 1956, a period of the year when natural rubber supplies are traditionally at their lowest.

Statistically, on the New York Commodity Exchange sales for the second half of November were 30,510 tons, bringing the monthly total to 71,600 tons. Sales during the first half of December were 30,140 tons, or 60,650 tons for the November 16-December 15 period, a clear indication of declining activity.

Near-December stocks began the period at 44.90¢ and came to an end on December 9 at 49.75¢. Far-December stocks began at 35.90¢ and were recorded at 36¢ on December 15.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures	Oct. 21	Nov. 18	Nov. 25	Dec. 2	Dec. 9
1955					
Dec.	41.80	45.10	49.50	51.25	49.75
1956					
Mar.	39.35	40.75	42.70	44.75	44.65
May	38.00	38.35	39.30	40.25	39.80
July	36.80	36.95	37.50	38.80	38.00
Sept.	35.55	35.85	36.40	37.75	36.60
Dec.	34.50	34.85	35.40	36.70	35.40
Total weekly sales, tons	17,470	20,840	10,990	15,130	14,290

On the physical market, R.S.S. #1 began the period at 46¢, rose to a period high of 49.75¢ on December 5, and fell to 48.25¢ by December 15.

November monthly average spot prices for representative grades follow: R.S.S. #1, 44.86¢; R.S.S. #3, 44.28¢; #3 Amber Blankets, 34.52¢; and Flat Bark, 29.37¢. For the first half of December, R.S.S. #1 averaged 49.03¢.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Oct. 21	Nov. 18	Nov. 25	Dec. 2	Dec. 9
R.S.S.: #1	43.50	46.00	48.50	49.50	49.50
2	43.25	45.75	48.25	48.75	48.75
3	43.00	45.50	48.00	48.50	48.50
Latex Crepe					
#1 Thick	45.50	47.50	49.50	49.50	49.00
Thin	45.50	47.50	49.50	49.50	49.00
#3 Amber Blankets	35.25	34.75	34.75	34.25	34.00
Thin Brown Crepe	34.75	34.25	34.25	33.75	33.50
Flat Bark	31.00	29.13	29.00	28.63	28.38

Synthetic Rubber

The first GR-S producer to take recognition of the realities of supply and demand has announced 1-3¢ price increases for its hot and cold special types of GR-S. Naugatuck Chemical Division of United States Rubber Co., Naugatuck, Conn., has revealed that, effective December 15, its Naugapol 1016, 1018, 1019, and 1021 were boosted 1¢ a pound in truckload quantities; Naugapol 1022 and 1023, 2¢; Naugapol 1503, 1½¢; and Naugapol 1504, 3¢. The new prices are f.o.b. Naugatuck, minimum transportation prepaid, as before.

GR-S type rubbers have been in short supply for some time, and demand for them is on the upswing. Producers have until now hesitated to bring their prices into line with basic economics because of a tacit agreement with the government to hold prices as stable as possible for as long as possible. Now that Naugatuck has taken the first step with some of the special types the rest of the industry is expected to follow suit, at least for these types.

The increases were revealed before the Rubber Disposal Commission was to have disclosed the results of closed bidding on the last government-held facility, the huge 122,000-ton-a-year Institute, W. Va., plant. Five days after the increases became effective, on December 20, it was announced that Goodrich-Gulf Chemicals, Inc., Cleveland, O., had submitted the highest bid, $11,000,000 and would take possession barring Justice Department and/or Congressional intervention.

The reactivation of the plant will have little effect on the dictates of short-term supply and demand. Goodrich-Gulf expects to have the first of three 40,000-ton GR-S units in operation by mid-May, with the date of total reactivation dependent upon the availability of butadiene. But the demand for GR-S type rubber is so insistent, and growing with such constancy, that the Naugatuck price increases, and those that are to follow, will still be in normal harmony with economic laws.

Latex

Activity in *Hevea* and synthetic latices during the period from November 16 to December 15 was generally quiet. Trading in the natural latex, particularly, was very slow, as prices, tied to the R.S.S. market, rose steadily during the period, gaining an average of about 5¢ above last month's average quotations. Buyers were normally reluctant to enter the market, hoping for a downward trend, but the apparent scarcity of near supplies forced more purchasing than would have ordinarily been done.

Prices for ASTM Centrifuged Concentrated latex, in tank-car quantities, f.o.b. rail tank cars, ranged during the period from 52 to 56¢ per pound solids. Synthetic latices remained static, and were quoted as: GR-S, 26-32.3¢; neoprene, 37-47¢; and N-type, 46-54¢.

Final September and preliminary October domestic statistics for all latices were reported as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Sept.	0	8,109	7,452	12,595
Oct.	0	....	7,322	12,072
GR-S				
Sept.	5,657	41	5,505	6,448
Oct.	6,186	18	5,705	5,684
Neoprene				
Sept.	994	0	730	975
Oct.	897	0	781	750
Nitrile				
Sept.	1,086	0	878	1,527
Oct.	861	0	990	1,373

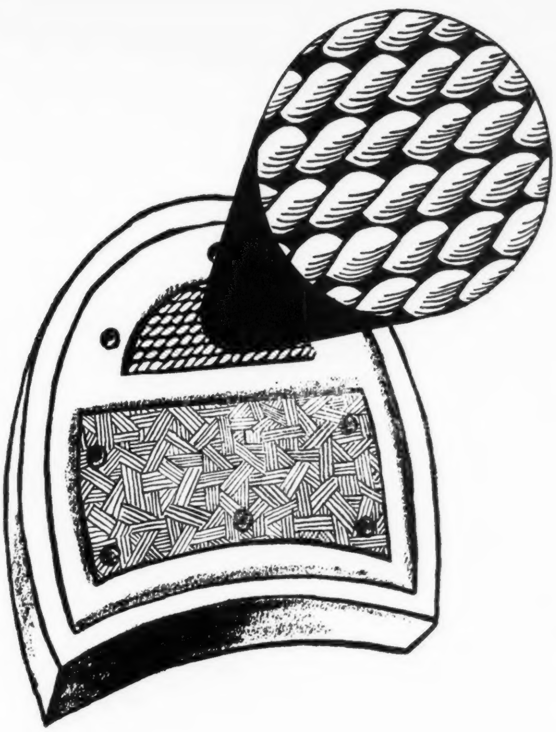
Reclaimed Rubber

The reclaimed rubber market during the period from November 16 to December 15 continued strongly active, according to all reports, and business was expected to remain at a high level for the rest of the year and somewhat beyond, although a slight fall is anticipated because of year-end inventories.

A midwestern reclaiming company revealed that its fiscal year ending October 31 was the most profitable in its history. It is generally believed that 1956 will be another good year.

One reason given for the diminishing demand for butyl reclaim is that its use in tubeless tire liners has not proved so satisfactory as expected. Although butyl is still an exceptional air retainer, it is said its adhesion to the carcass is somewhat less than perfect, and a trend to GR-S type and natural rubber reclaim for this purpose is anticipated. Such a trend may be

DETAILS



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	5000 lbs. to truckloads	— .1425¢ lb.
	Truckloads	— .1375¢ lb.

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delayed, however, owing to the shortage of GR-S type rubber, and, therefore, GR-S type reclaim.

Reclaimed rubber prices, according to reports, remained the same as last month's.

RECLAIMED RUBBER PRICES

	Lb.
Whole tire: first line	$0.105
Fourth line	.0925
Inner tube: black	.15
Red	.21
Butyl	.16
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Scrap Rubber

Very quiet conditions characterized the scrap rubber market during the period from November 16 to December 15, continuing last period's trend. Most suppliers were said to have confined their activities to the filling of mixed tire orders for December shipment to Naugatuck. Demand for synthetic butyl tubes slackened considerably, and prices asked for them dropped fractionally.

As of this writing, scrap rubber export and import figures were not available from the Bureau of the Census, United States Department of Commerce.

Period-end prices, unchanged except for a slight fall in butyl tubes, were:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$12.00/15.00	$15.00/16.00
S. A. G. auto tires	Nom.	13.00
Truck tires	Nom.	14.00
Peelings, No. 1	41.00/42.00	41.00/42.00
2	23.00	24.00
3	15.50	Nom.
Tire buffing	17.00	14.00/15.00
	(¢ per Lb.)	
Auto tubes, mixed	4.50	4.50
Black	5.50	5.50
Red	6.50	6.50
Butyl	6.00	6.00

Cotton Fabrics

Trading continued strong on the industrial fabrics market during the period from November 16 to December 15, with tightened supplies of enameling ducks, wide sateens, drills, and other coating fabrics being noted, and further January or February deliveries hard to arrange. Even second-quarter deliveries were proving difficult, particularly in the narrow types of enameling ducks. Observers reported that trading in these ducks actually developed several weeks before and continued strong until recently, with mills selling out practically all of their production for the first quarter and much of their production for the second quarter.

Price increases over the period included a 1¢ boost for 38-inch, 2.00-yd. D.F. enameling ducks. Fractional increases were noted elsewhere. Period-end prices follow:

COTTON FABRICS

Drills		
59-inch 1.85 yd.	*yd.*	$0.40
2.25-yd.		.345
Ducks		
38-inch 1.78-yd. S.F.	*yd.*	nom.
2.00-yd. D.F.		.32
51.5-inch, 1.35-yd. D.F.		.4675
Hose and belting		.67
Raincoat Fabrics		
Printcloth, 38½-inch, 64x60, 5.35-yd.	*yd.*	.1425
6.25 yd.		.12
Sheeting, 48-inch, 4.17-yd.		.20
52-inch, 3.85-yd.		.24
Osnaburgs		
40-inch 2.11-yd.	*yd.*	.265
3.65-yd.		.1675
Chafer Fabrics		
14.40-oz./sq. yd. Pl.	*yd.*	.70
11.65-oz./sq. yd. S.		.61
10.80-oz./sq. yd. S.		.6575
8.9-oz./sq. yd. S.		.67
Other Fabrics		
Headlining, 59-inch, 1.65-yd., 2-ply	*yd.*	.47
64-inch, 1.25-yd., 2-ply		.595
Sateens, 53-inch, 1.32-yd.		.5675
58-inch, 1.21-yd.		.62

Rayon

Total calculated production of rayon and acetate yarn during November was 71,800,000 pounds, of which 35,300,000 pounds were regular-tenacity yarn and 36,500,000 pounds were rayon high-tenacity yarn. October production follows: total, 73,000,000 pounds; regular-tenacity, 35,300,000 pounds; and high-tenacity, 37,700,000 pounds.

Total shipments for November were 71,100,000 pounds, consisting of 34,900,000 pounds of regular-tenacity yarn and 36,200,000 pounds of rayon high-tenacity yarn. October shipments were: total, 72,100,000 pounds; regular-tenacity, 35,000,000 pounds; and high-tenacity, 37,100,000 pounds.

Total end-of-November stocks were 49,300,000 pounds, of which 43,200,000 pounds were regular-tenacity yarn and 6,100,000 pounds were rayon high-tenacity yarn. End-of-October stocks follow: total, 48,600,000 pounds; regular-tenacity, 42,800,000 pounds; and high-tenacity, 5,800,000 pounds.

Prices per pound of rayon tire yarns and fabrics remained unchanged, as below:

RAYON PRICES

Tire Yarns	
High-Tenacity	
1100/ 480	$0.62
1100/ 490	.62
1150/ 490	.62
1165/ 480	.63
1230/ 490	.62
1650/ 720	.61
1650/ 980	.61
1875/ 980	.61
2200/ 960	.60
2200/ 980	.60
2200/1466	.67
4400/2934	.63
Super-High-Tenacity	
1650/ 720	.64
1900/ 720	.64
Tire Fabrics	
1100/490/2	.72
1650/980/2	.695 / $0.73
2200/980/2	.685

Foam Talk

(*Continued from page 535*)

used for compounding foam rubber and listed their properties. He explained the use of the frothing and gelling techniques and expounded on the test methods for foam rubber.

While praising the unique property of non-flammability of the polyester isocyanate foams, he predicted that the production of foam rubber products will continue to expand in the years ahead.

Giles Barrett, Brigadier General of the Salvation Army, was the after-dinner speaker. His topic was "Hobos."

Kullgren at Fort Wayne

G. V. Kullgren, Hale & Kullgren, Inc., Akron, O., addressed 186 members and guests of the Fort Wayne Rubber & Plastics Group at the Van Orman Hotel, Fort Wayne, Ind., December 1, on the subject of "Status of Automation in the Rubber and Plastics Industries."

Mr. Kullgren gave examples of automation or mechanization in various processes in the rubber industry and, to a lesser degree, in the plastics industry. Future trends in automation were also speculated upon. His address appears in full in our June, 1955, issue (page 339).

Post-dinner entertainment consisted of renditions by the Laboratory Quartet of The General Tire & Rubber Co., Akron, O.: George Berg, Jack Miller, William Long, and DeVon Wilson.

The February 9 meeting of the Group will be devoted to a panel discussion on anti-ozonants.

Cyanamid Buying Formica

American Cyanamid Co., New York, N. Y., has revealed that negotiations are in progress for its purchase of the business and assets of The Formica Co., Cincinnati, O., which is a manufacturer of laminated plastics.

Although detailed terms of the acquisition are still in discussion, it is understood that Formica stockholders would receive 1¾ shares of Cyanamid stock for each share of Formica stock outstanding. No change in Formica management is expected.

Formica's net earnings in 1954 were $2,100,000; Cyanamid's $27,000,000. Currently Cyanamid has nine operating divisions, including two wholly owned subsidiaries.

Synthetic Rubbers and Latices*

Acrylic Types

Hycar 4021	$1.35[a]
4501	.81[a]

Isobutylene Types

Enjay Butyl 035, 150, 215, 217, 218, 325	.23[a]
165, 265, 267, 268, 365	.24[a]
Hycar 2202	.65[a]
Polysar Butyl 100, 200, 300, 400	.245[c]
101	.2775[a]
301	.255[c]
Vistanex	.45[a]

Neoprene

Neoprene Type AC, CG	.55[a]
GN, GN-A	.41[a]
GRT, S	.42[a]
KNR	.75[a]
W	.39[a]
WRT	.45[a]

Latices

Neoprene Latex 571, 842-A	.37[a]
572	.39[a]
601-A	.40[a]
735, 736	.38[a]
950	.47[a]

Nitrile Types

Butaprene NAA	.54[a]
NF	.49[a]
NL	.50[a]
NXM	.58[a]
Chemigum 30N4NS, 50N4NS	.50[a]
N3	.58[a]
Hycar 1001 1041	.58[b]
1002, 1042, 1043	.50[b]
1014, 1312	.60[b]
1411	.62[b]
1432	.59[b]
1441	.64[b]
Paracril AJ	.485[a]
B, BJ, BLT	.50[a]
C	.58[a]
D	.65[a]
1880	.60[a]
Polysar Krynac 800, 802, 803	.50[c]
801	.58[c]

Latices

Butaprene NSP 192	.54[a]
NSP 193	.46[a]

[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
*Prices are per pound carload or tank car dry weight unless otherwise specified.
†Listed below are the new GR-S type synthetic rubbers and latices trade names and the chief sales offices of their producers or distributors.

ASRC	—American Synthetic Rubber Corp., 500 Fifth Ave., New York 36, N. Y.
Baytown	—United Rubber & Chemical Co., Baytown, Tex. (producer); United Carbon Co., Inc., Charleston 27, W. Va. (distributor).
Butaprene S	—Firestone Tire & Rubber Co., Synthetic Rubber Division, 381 Wilbeth Rd., Akron 1, O.
Copo	—Copolymer Rubber & Chemical Corp., P. O. Box 1029, Baton Rouge 1, La.
G-G	—Goodrich-Gulf Chemicals, Inc., 3121 Euclid Ave., Cleveland 15, O.
Naugapol, Naugatex	—Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
Philprene	—Phillips Chemical Co., Rubber Chemicals Division, 318 Water St., Akron 8, O.
Plioflex	—Goodyear Synthetic Rubber Corp., 1144 Market St., Akron 16, O.
Pliolite Latex	—Goodyear Synthetic Rubber Corp. Also distributed by General Latex & Chemical Corp., 666 Main St., Cambridge 39, Mass.
Polysar	—Polymer Corp., Ltd., Sarnia, Ont., Canada (producer); H. Muehlstein & Co., Inc., 60 E. 42nd St., New York 17, N. Y. (distributor).
S-	—Shell Chemical Corp., Synthetic Rubber Sales Division, 30 W 50th St., New York 20, N. Y.
Synpol	—Texas-U. S. Chemical Co., Port Neches, Tex. (producer); Naugatuck Chemical (distributor).

Chemigum 200	$0.49[a]
235 AHS, 235 CHS, 235 HS, 236	.54[a]
245 AHS, 245 CHS, 245 HS, 246	.46[a]
Hycar 1512, 1552, 1562, 1577	.46[a]
1551, 1561	.54[a]
1571	.59[a]
1572	.51[a]
Nitrex 2612, 2614	.46[a]
2615	.51[a]

Polysulfide Types

Thiokol LP-2, -3, -32, -33	.96[a]
-8, -38	1.25[a]
PR-1	.95[a]
Type-A	.47[a]
FA	.69[a]
ST	1.00[a]

Latices

Thiokol Latex (dry wt.)	
Type MF	.85[a]
MX	.70[a]
WD-2	.92[a]
-5	.95[a]
-6, -7	.70[a]

Silicone Types

GE (compounded)	2.25[a] /	$4.10
Silicone gum (not compounded)	4.00[a] /	4.90[a]
Silastic (compounded)	2.30[b] /	4.00[b]

Styrene Types†

Hot RS

Butaprene S-1000, -1001, -1004, 1006	.23[a]
-1002, -1005, -1009	.2455[a]
-1010	.245[a]
-1012, -1013	.243[a]
-1014	.248[a]
-1015	.28[a]
G-G 1001, 1006	.241[c]
Naugapol 1016, 1019	.265[b]
1018	.27[b]
1021	.30[b]
1022	.28[b]
1023	.285[b]
Philprene 1000, 1001, 1006	.25[b]
1009	.255[b]
1018	.2575[b]
1019	.2525[b]
Plioflex 1000, 1006	.2425[c]
Polysar S, S-50, S-65	.241[c]
SS-250	.30[c]
S-X-371	.255[c]
S-1000, -1001, -1006, -1013	.23[a]
-1002, -1011	.2325[a]
Synpol 1000, 1001, 1006, 1007, 1012	.2425[b]
1002	.245[b]
1009	.2475[b]
1013	.25[b]

Hot RS Black Masterbatch

S-1100	.185[a]

Cold RS

ASRC-1500, -1502	.241[c]
Butaprene S-1500, -1502	.23[a]
Copo 1500, 1502	.241[c]
G-G 1500, 1501, 1502	.241[c]
Naugapol 1503	.27[b]
1504	.295[b]
Philprene 1500, 1502	.25[b]
1503	.2525[b]
Plioflex 1502	.2425[c]
Polysar Krylene	.241[c]
S-1500, -1502	.23[b]
Synpol 1500, 1551	.2425[b]

Cold RS Black Masterbatch

Baytown 1600, 1601, 1602	.185[a]
Philprene 1600, 1601, 1602	.20[b]
1605	.194[b]
S-1600, -1601, -1602	.185[a]

Cold RS Oil Masterbatch

Butaprene S-1703	.195[a]
-1705	.1925[a]
-1710, -1712	.1775[a]
G-G 1703	.206[c]
1705, 1706	.2035[c]
1707	.191[c]
1709, 1710, 1711, 1712	.1885[c]
Philprene 1703	$0.212[b]
1706	.21[b]
1708	.197[b]
1711, 1712	.194[b]
Polysar Krynol	.20[c]
S-1703	.195[a]
-1705, -1706	.1925[a]
-1707	.18[a]
-1709, -1712	.1775[a]
Synpol 1703	.2075[b]
1707	.1925[b]
1708	.195[b]
1710, 1711	.19[b]

Cold RS Oil-Black Masterbatch

Baytown 1801	.17[a]
Philprene 1803	.18[b]
S-1801	.17[a]

Hot RS Latices

Butaprene S Latex Type 2000, 2001, 2006	.26[a]
2002	.285[a]
2003, 2004	.295[a]
Naugatex 2000, 2001, 2006	.263[a]
2002	.288[a]
2005	.30[a]
S-2000	.2275[a]
-2004	.26[a]

Cold RS Latices

Butaprene S Latex Type 2105	.31[a]
Copo 2101	.28[c]
2102, 2105	.31[c]
X-765	.29[c]
Naugatex 2101	.285[a]
2105	.312[a]
X-767	.323[a]
Pliolite Latex 2101, X765	.30[c]
2104, 2105	.32[c]
S-2101	.225[a]

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Financial

(*Continued from page 554*)

Cooper Tire & Rubber Co., Findlay, O. January 1-September 30, 1955: net earnings, $269,639, equal to $1.72 a share, against $60,786, or 38¢ a share, in the previous year's period.

Crown Cork & Seal Co., Baltimore, Md. Nine months to September 30, 1955: net earnings, $1,268,003, equal to 71¢ a share, against $1,271,535, or 71¢ a share, in the 1954 months.

DeVilbiss Co., Toledo, O. Nine months to September 30, 1955: net earnings, $873,-168, equal to $2.34 a share, compared with $530,807, or $1.42 a share, a year earlier.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Nine months ended September 30, 1955: net earnings, $291,-603,652, equal to $6.24 a common share, compared with $223,797,063, or $4.74 a share, in the corresponding months of the preceding year; net sales and other operating revenues, $1,442,118,692, against $1,-247,502,068.

Glidden Co., Cleveland, O., and subsidiaries. Ten months ended August 31, 1955: net profit, $7,112,567, equal to $3.10 a capital share, against $7,093,043, or $3.09 a share, in the 12 months ended October 31, 1954; net sales, $180,524,822, against $209,083,579.

Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.025 /	$0.065
Rottenstone, domestic	lb.	.03 /	.04
Shelblast	ton	80.00 /	165.00
Walnut Shell Grits	ton	50.00 /	160.00

Accelerators

A-1 (Thiocarbanilide)	lb.	.50 /	.57
A-32	lb.	.66 /	.80
A-100	lb.	.52 /	.66
Accelerator 49	lb.	.55 /	.56
108	lb.	.90	
552	lb.	2.25	
808	lb.	.66 /	.68
833	lb.	1.17 /	1.19
Altax	lb.	.50 /	.52
Arazate	lb.	2.25	
Beutene	lb.	.66 /	.71
Bismate	lb.	3.00	
B-J-F	lb.	.27 /	.32
Butasan	lb.	1.04	
Butazate	lb.	1.04	
Butyl Accelerator 21	lb.	.89	
Eight	lb.	1.10 /	1.35
Zimate	lb.	1.04	
Captax	lb.	.40 /	.42
C-P-B	lb.	1.95	
Cumate	lb.	1.45	
Diesterex N	lb.	.50 /	.57
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.60 /	.61
Du Pont	lb.	.57 /	.58
DPG (diphenylguanidine)			
Cyanamid	lb.	.50 /	.51
Monsanto	lb.	.48 /	.55
El-Sixty	lb.	.58 /	.65
Ethasan	lb.	1.04	
Ethazate	lb.	1.04	
50-D	lb.	.85	
Ethyl Thiurad	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04	
Zimate	lb.	1.04	
Ethylac	lb.	.93 /	.95
Hepteen	lb.	.44 /	.50
Base	lb.	1.85	
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.40 /	.42
Du Pont	lb.	.38 /	.40
Naugatuck	lb.	.40 /	.45
-XXX, Cyanamid	lb.	.51 /	.53
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.50 /	.52
Du Pont	lb.	.48 /	.50
Naugatuck	lb.	.50 /	.55
-W Cyanamid	lb.	.53 /	.55
Mertax	lb.	.51 /	.58
Methasan	lb.	1.04	
Methazate	lb.	1.04	
Methyl Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14	
Mono-Thiurad	lb.	1.14	
Morfex	lb.	.65 /	.70
MT	lb.	1.00	
NOBS No. 1	lb.	.72 /	.74
Special	lb.	.77 /	.79
O-X-A-F	lb.	.51 /	.56
Pentex	lb.	1.04	
Flour	lb.	.21	
Permalux	lb.	2.17	
Phenex	lb.	.52 /	.59
Pip-Pip		2.07	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.51 /	.53
RZ-50, -50B	lb.	1.00	
S. A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	2.50	
Santocure	lb.	.72 /	.79
NS	lb.	.78 /	.85
Selenacs	lb.	2.60	
SPDX-GH	lb.	.69 /	.74
GL	lb.	1.20 /	1.34
Tellurac	lb.	1.21	
Tepidone	lb.	.45	
Tetrone A	lb.	1.91	
Thiofide	lb.	.50 /	.57
S	lb.	.52 /	.59
Thionex	lb.	1.14	
Thiotax	lb.	.40 /	.47
Thiurad	lb.	1.14	
Thiuram E	lb.	1.04	
M	lb.	1.14	
Trimene	lb.	.56 /	.62
Base	lb.	1.03 /	1.10
Tuex	lb.	1.14	
Ultex	lb.	1.00 /	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66 /	.73
Vulcacure NB	lb.	.45	
ZB, ZE, ZM	lb.	.85	
Vulcacure Z-B-X		$2.45	
Zenite	lb.	.48 /	$0.50
A	lb.	.49 /	.51
Special	lb.	.49 /	.51
Zetax	lb.	.51 /	.53
Zimate	lb.	1.04	

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Accelerator-Activators, Inorganic

Lime, hydrated	ton	20.21	
Litharge, comml.	lb.	.17 /	.175
Eagle, sublimed	lb.	.171	
National Lead, sublimed	lb.	.17 /	.18
Red lead, comml.	lb.	.18 /	.19
Eagle	lb.	.18	
National Lead	lb.	.18 /	.1925
White lead, carbonate	lb.	.175 /	.19
Eagle	lb.	.18 /	.19
National Lead	lb.	.18 /	.19
Silicate	lb.	.1625/	.20
Eagle	lb.	.19 /	.2075
National Lead	lb.	.1625/	.1725
Zinc oxide, comml.†	lb.	.14 /	.1825

Accelerator-Activators, Organic

Aktone	lb.	.22 /	.23
Barak	lb.	.62	
Capital 170	lb.	.2275/	.2675
171	lb.	.1325/	.1725
700, 701	lb.	.155 /	.195
705, 710	lb.	.155 /	.195
800	lb.	.12 /	.14
801	lb.	.1375/	.1575
802	lb.	.1425/	.1625
803	lb.	.165 /	.185
Curade	lb.	.57 /	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1375/	.1775
Groco 30	lb.	.1375/	.1775
35	lb.	.1425/	.1625
Guantal	lb.	.57 /	.64
Hyfac 400	lb.	.1187/	.145
430	lb.	.1612/	.1875
431	lb.	.1837/	.1975
Hystrene S-97	lb.	.1863/	.2125
T-45	lb.	.1688/	.195
T-70	lb.	.1788/	.205
Industrene B	lb.	.1313/	.1575
R	lb.	.1188/	.145
158	lb.	.1363/	.1625
254	lb.	.1463/	.1725
262	lb.	.1563/	.1825
Laurex	lb.	.33 /	.37
MODX	lb.	.295 /	.345
NA-22	lb.	1.50	
Oleic acid, comml.	lb.	.165 /	.23
Emersol 210 Elaine	lb.	.165 /	.205
Groco 2, 4, 8, 18	lb.	.165 /	.205
Plastone	lb.	.27 /	.30
Polyvac	lb.	1.65	
Ridacto	lb.	.25 /	.26
Seedine	lb.	.1485/	.1703
Stearex Beads	lb.	.1488/	.1588
Stearic acid			
Emersol 120	lb.	.1462/	.1725
150	lb.	.1787/	.1725
Hydrofol 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco	lb.	.125 /	.145
Rufat 75	lb.	.1187/	.145
Single pressed, comml.	lb.	.1475/	.1675
Emersol 110	lb.	.1412/	.1675
Groco 53	lb.	.1475/	.1675
Wilmar 253	lb.	.1412/	.1675
Double pressed, comml.	lb.	.1525/	.1725
Groco 54	lb.	.1525/	.1725
Wilmar 254	lb.	.1462/	.1725
Triple pressed, comml.	lb.	.175 /	.195
Groco 55	lb.	.175 /	.195
Wilmar 255	lb.	.1687/	.195
Sterene 60-R	lb.	.09 /	.1075
Tonox	lb.	.515 /	.605
Vulklor	lb.	.88 /	1.08
Wilmar 110	lb.	.165 /	.205
434	lb.	.1375/	.1775
Zinc stearate, comml.	lb.	.39 /	.44

Antioxidants

AgeBest A26	lb.	.18 /	.24
620-32B	lb.	.20 /	.26
716-30	lb.	.18 /	.24
1041-21	lb.	.165 /	.225
1293-22A	lb.	1.90 /	2.00
AgeRite Alba	lb.	2.35 /	2.45
Gel	lb.	.64 /	.66
H. P.	lb.	.72 /	.74
Hipar	lb.	.98 /	1.00
Powder	lb.	.52 /	.54
Resin	lb.	.75 /	.77
D	lb.	.52 /	.54
Spar	lb.	.52 /	.54
Stalite	lb.	.52 /	.54
S	lb.	.52 /	.54
White	lb.	1.45 /	1.55
Akroflex C	lb.	.77 /	.79
CD	lb.	.72 /	.74
Albasan	lb.	.69 /	.73
Allied AA-1144	lb.	.23 /	.24
AA-1177	lb.	.155 /	.165
Aminox	lb.	.52 /	.57
Antioxidant 425	lb.	2.47 /	2.50
2246	lb.	1.50 /	1.53
Antisol	lb.	$0.23 /	$0.24
Antisun	lb.	.15 /	.51
Antox	lb.	.52 /	.75
Aranox	lb.	3.25	.54
Betanox Special	lb.	.80 /	.85
B-L-E, -25	lb.	.52 /	.57
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.52 /	.57
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91 /	1.16
Flectol H	lb.	.52 /	.59
Flexamine	lb.	.72 /	.77
Heliozone	lb.	.26 /	.27
Ionol	lb.	.91 /	1.40
NBC	lb.	1.55	
Neozone A	lb.	.56 /	.58
D	lb.	.52 /	.54
Octamine	lb.	.52 /	.57
PDA-10	lb.	.46 /	.48
Perflectol	lb.	.61 /	.68
Polygard	lb.	.52 /	.57
Protector	lb.	.26 /	.31
Rio Resin	lb.	.60 /	.62
Santoflex 35	lb.	.72 /	.79
75	lb.	.92 /	.99
AW	lb.	.78 /	.85
B	lb.	.52 /	.59
BX	lb.	.63 /	.70
DD	lb.	.52 /	.59
Santovar A	lb.	1.50 /	1.57
Santowhite Crystals, Powder	lb.	1.60 /	1.67
L	lb.	.52 /	.59
MK	lb.	1.29 /	1.36
Sharples Wax	lb.	.23 /	.28
Stabilite	lb.	.55 /	.59
Alba	lb.	.72 /	.79
L	lb.	.60 /	.64
White	lb.	.52 /	.60
Powder	lb.	.41 /	.47
Styphen I	lb.	.51 /	.55
Sunolite #100	lb.	.21 /	.23
#127	lb.	.17 /	.19
Sunproof -713	lb.	.25 /	.30
Improved	lb.	.25 /	.30
Jr.	lb.	.20 /	.25
Thermoflex A	lb.	.98 /	1.00
Tonox	lb.	.52 /	.57
Tysonite	lb.	.24 /	.2475
Velvapex 51-250	lb.	.40	
V-G-B	lb.	.70 /	.70
Wing-Stay S	lb.	.52 /	.61
Zenite	lb.	.48 /	.55

Antiseptics

Copper naphthenate, 6-8%	lb.	.24	
Pentachlorophenol	lb.	.21 /	.29
Resorcinol, technical	lb.	.775 /	.785
Zinc naphthenate, 8-10%	lb.	.245 /	.30

Blowing Agents

Ammonium bicarbonate	lb.	.065 /	.085
Carbonate	lb.	.16	
Blowing Agent CP-975	lb.	.35	
Celogen	lb.	1.95	
50-C	lb.	1.01 /	1.07
Sodium bicarbonate	100 lbs.	2.70 /	3.30
Carbonate tech.	100 lbs.	1.35 /	5.52
Sponge Paste	lb.	.20	
Unicel	lb.	.90	
ND	lb.	.76	
S	lb.	.20	

Bonding Agents

Braze	gal.	6.00 /	9.00
Cover cement	gal.	2.50 /	4.00
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52 /	5.10
SS-64	lb.	3.65 /	6.75
-67 Primer	lb.	7.50 /	12.50
Gen-Tac Latex	lb.	.75 /	.855
Kalabond Adhesive	gal.	6.50 /	16.00
Tie Cement	gal.	2.00 /	5.60
MDI	lb.	4.00 /	6.00
-50	lb.	2.00 /	3.00
Thixons	gal.	1.48 /	12.00
Ty Ply BN, Q, S, UP, 3640	gal.	6.75 /	8.00
RC	gal.	3.75 /	5.00

Brake Lining Saturants

BRT 3	lb.	.018 /	.0265
Resinex L-S	lb.	.0225/	.03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.23 /	.30
Kosmos/Dixie BB	lb.	.23 /	.30
Spheron C	lb.	.14 /	.185
Voltex	lb.	.18 /	.315

Easy Processing Channel—EPC

Continental AA	lb.	.074 /	.1225
Kosmobile 77/Dixiedensed 77	lb.	.074 /	.1225
Micronex W-6	lb.	.074 /	.1225
Spheron #9	lb.	.074 /	.1225
Texas E	lb.	.074 /	.1225
Witco #12	lb.	.074 /	.1225
Wyex	lb.	.074 /	.12

Hard Processing Channel—HPC

Continental F	lb.	.074 /	.1225
HX	lb.	.074 /	.12
Kosmobile S/Dixiedensed S	lb.	.074 /	.1225

Micromex Mk. II	lb.	$0.074	$0.1225
Spheron #4	lb.	.074	.1225
Witco #6	lb.	.074	.1225

Medium Processing Channel—MPC

Arrow TX	lb.	.074	.12
Continental A	lb.	.074	.1225
Kosmobile S-66/Dixiedensed S-66	lb.	.074	.1225
Micronex Standard	lb.	.074	.1225
Spheron #6	lb.	.074	.1225
Texas 109	lb.	.079	.1275
M	lb.	.074	.1225
Witco #1	lb.	.074	.1225

Conductive Furnace—CF

Aromex 115	lb.	.089	.129
Vulcan C	lb.	.105	.15
SC	lb.	.18	.223

Fast Extruding Furnace—FEF

Arovel	lb.	.06	.10
Continex FEF	lb.	.06	.10
Kosmos 50/Dixie 50	lb.	.06	.10
Statex M	lb.	.06	.10
Sterling SO	lb.	.06	.10

Fine Furnace—FF

Statex B	lb.	.065	.105
Sterling 99	lb.	.065	.105

High Abrasion Furnace—HAF

Aromex	lb.	.079	.119
Continex HAF	lb.	.079	.125
Kosmos 60/Dixie 60	lb.	.079	.1175
Philblack O	lb.	.079	.119
Statex R	lb.	.074	.12
Vulcan #3	lb.	.079	.125

Intermediate Super Abrasion Furnace—ISAF

Aromex 125	lb.	.10	.14
Kosmos 70/Dixie 70	lb.	.10	.145
Philblack I	lb.	.10	.145
Statex 125	lb.	.09	.135
Vulcan 6	lb.	.10	.145

Medium Abrasion Furnace—MAF

Philblack A	lb.	.06	.10

Super Abrasion Furnace—SAF

Philblack E	lb.	.125	.165
Vulcan 9	lb.	.125	.168

General-Purpose Furnace—GPF

Arogen GPF	lb.	.05	.09
Sterling V	lb.	.05	.09
V Non-staining	lb.	.05	.09

High Modulus Furnace—HMF

Continex HMF	lb.	.055	.095
Kosmos 40/Dixie 40	lb.	.055	.095
Modulex	lb.	.055	.095
Statex 93	lb.	.055	.095
930	lb.	.047	.087
Sterling L, LL	lb.	.055	.095

Semi-Reinforcing Furnace—SRF

Continex SRF	lb.	.045	.085
Essex	lb.	.045	.085
Furnex	lb.	.0475	.0875
Gastex	lb.	.0525	.0925
Kosmos 20/Dixie 20	lb.	.045	.085
Pelletex, NS	lb.	.0475	.0875
Sterling NS, S	lb.	.0475	.0875
R	lb.	.0525	.0925

Fine Thermal—FT

P-33	lb.	.055	
Sterling FT	lb.	.055	

Medium Thermal—MT

Sterling MT	lb.	.04	
Non-staining	lb.	.05	
Thermax	lb.	.04	
Stainless	lb.	.05	

Colors

Black

Iron oxides, comml	lb.	.1275	.13
BK—Lansco	lb.	.1275	.13
Williams	lb.	.1325	.135
Lansco synthetic	lb.	.10	
Mapico	lb.	.1275	.13
Lampblack, comml	lb.	.16	.45
Superjet	lb.	.0825	.1175
Permanent Blue	lb.	.80	1.05
Stan-Tone	lb.	.45	1.20
Vansul masterbatch	lb.	.60	.65
Paste	lb.	.14	.15

Blue

Cyanamid ultramarine	lb.	.165	
Du Pont	lb.	1.77	4.55
Filo	lb.	.28	
Heveatex pastes	lb.	.80	1.45
Lansco ultramarines	lb.	.25	.28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80	1.05
Stan-Tone	lb.	1.55	1.60
Vansul masterbatch	lb.	.90	2.70

Brown

Filo	lb.	$0.13	
Iron oxides, comml	lb.	.1375	$0.14
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1375	.14
Brown 422	lb.	.14	
Sienna, burnt, comml	lb.	.0425	.155
Williams	lb.	.11	.1725
Raw, comml	lb.	.045	.1325
Williams	lb.	.08	.1725
Umber, burnt, comml	lb.	.06	.07
Williams	lb.	.0675	.08
Raw, comml	lb.	.0625	.07
Williams	lb.	.07	.0825
Williams, pure brown	lb.	.1425	.145
Vandyke	lb.	.12	
Mapico Tan 20	lb.	.2025	.205
Tan 15	lb.	.205	
Metallic brown	lb.	.045	.055
Vansul masterbatch	lb.	2.10	2.20

Green

Chrome	lb.	.19	.50
Oxide	lb.	.3925	1.10
Cyanamid	lb.	1.10	
G-4099, -6099	lb.	.42	
GH-9869	lb.	1.05	1.20
9976	lb.	1.15	1.30
Green	lb.	.80	2.40
Du Pont	lb.	1.97	2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95	1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	
Stan-Tone	lb.	1.75	4.60
Vansul masterbatch	lb.	2.00	2.60

Orange

Cyanamid Permatons	lb.	1.35	
Du Pont	lb.	2.75	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone	lb.	.70	3.35
Vansul masterbatch	lb.	2.00	2.60

Red

Antimony trisulfide	lb.	.285	.315
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Cadmium red lithopone	lb.	1.99	3.05
Cadmolith	lb.	1.72	2.20
Cyanamid	lb.	.85	1.60
Du Pont	lb.	1.47	1.80
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml	lb.	.06	.13
Lansco synthetic	lb.	.1175	
Mapico	lb.	.1275	.13
Recco	lb.	.12	
Williams Red	lb.	.1275	.15
Monsanto Maroon 113	lb.	1.50	
61148	lb.	1.75	
Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Rub-Er-Red	lb.	.0975	
Stan-Tone	lb.	.85	4.05
Tuscan	lb.	.15	.46
Vansul masterbatch	lb.	.95	3.30
Venetian	lb.	.035	.0625

White

Antimony oxide	lb.	.27	.305
Burgess Iceberg	ton	50.00	80.00
Cryptone BT	lb.	.10	.11
Permolith	lb.	.075	.085
Titanium pigments			
Rayox LW	lb.	.195	.205
R-110	lb.	.215	.225
Ti-Cal	lb.	.075	.0825
Ti-Pure	lb.	.195	.225
Titanox A, AA, A-168	lb.	.21	.22
C-50	lb.	.1225	.1275
RA, -10, -50	lb.	.23	.24
RC	lb.	.0825	.0875
-HT, -HTX	lb.	.08	.085
Unitane	lb.	.225	.255
Zopaque Anatase	lb.	.225	.235
Rutile	lb.	.245	.255
Zinc oxide, comml	lb.	.135	.1775
Azo ZZZ-11, -44, -55	lb.	.14	.16
20% leaded	lb.	.1435	.1635
35% leaded	lb.	.14625	.16625
50% leaded	lb.	.14875	.16875
Eagle AAA, lead free	lb.	.14	.15
5% leaded	lb.	.14	.15
35% leaded	lb.	.14625	.15625
50% leaded	lb.	.14875	.15875
Florence Green Seal	lb.	.1575	.1675
Red Seal	lb.	.1525	.1625
White Seal	lb.	.1625	.1725
Horsehead XX-4, -78	lb.	.135	.145
Kadox-15, -17, -72, -515	lb.	.14	.15
-25	lb.	.1625	.1725
Lehigh, 35% leaded	lb.	.14625	.15625
50% leaded	lb.	.14875	.15875
Protox-166, -167	lb.	.14	.15
St. Joe, lead free	lb.	.118	.16
Zinc sulfide, comml	lb.	.253	.263
Cryptone ZS	lb.	.253	.263

Yellow

Cadmium yellow lithopone	lb.	$1.15	
Cadmolith	lb.	1.12	$1.20
Du Pont	lb.	1.80	2.15
Filo	lb.	.10	
Iron oxide, comml	lb.	.0525	.1075
Lansco synthetic	lb.	.1075	
Mapico	lb.	.105	.1075
Williams	lb.	.11	.1175
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BYP-282	lb.	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone	lb.	1.00	1.55
Vansul masterbatch	lb.	.95	1.95
Williams Ocher	lb.	.0525	.055

Dusting Agents

Diatomaceous silica	ton	32.00	48.00
Extrud-o-Lube, conc	gal.	1.54	1.69
Glycerized Liquid Lubricant, concentrated	gal.	1.48	1.63
Latex-Lube GR	lb.	.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30	.35
Lubrex	lb.	.25	.30
Mica Concord	lb.	.075	.0825
Mineralite	ton	45.00	
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Talc, comml	ton	18.40	38.50
EM	ton	11.00	63.00
LS Silver	ton	29.25	
Nytals	ton	25.00	36.00
Sierra Sagger 7	ton	34.00	
White IR	ton	19.75	
III	ton	20.75	
Vanfre	gal.	2.00	

Extenders

BRS 700	lb.	.02	.0285
BRT 7	lb.	.03	.031
Cumar Resins	lb.	.065	.17
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29	.36
Brown	lb.	.1425	.268
Neophax	lb.	.157	.268
White	lb.	.144	.285
G. B. Asphaltenes	lb.	.06	.065
Millex, W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	38.00	40.00
Hard Hydrocarbon	ton	46.50	48.50
Hydrocarbon MR	ton	45.00	55.00
Parmr	ton	21.00	29.00
T-MR Granulated	ton	47.50	50.00
Nuba No. 1, 2	lb.	.0575	.0625
3X	lb.	.0775	.0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.1835	.2012
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.148	.256
Stan-Shells	ton	35.00	73.00
Sublac Resin PX-5	lb.	.215	.235
Synthetic 100	lb.	.41	
Vistanex	lb.	.45	.475

Fillers, Inert

Agrashell flour	ton	50.00	74.00
Barytes, floated, white	ton	41.60	60.10
Off-color, domestic	ton	25.00	
No. 1	ton	41.35	60.10
2	ton	39.35	58.00
Sparmite	ton	75.00	80.00
Blanc fixe	ton	100.00	165.00
Burgess Iceberg	ton	50.00	80.00
Pigment #20	ton	35.00	60.00
#30	ton	37.00	60.00
HC-75	ton	12.00	30.00
-80	ton	14.00	32.00
WP #1	ton	11.00	16.00
Cary #200	ton	30.00	55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	
Clays, Aiken	ton	14.00	
Albacar	ton	50.00	55.00
Aluminum Flake	ton	20.00	60.00
#5	ton	23.50	30.00
Champion	ton	14.00	
Crown	ton	14.00	33.00
Dixie	ton	14.00	
Franklin	ton	13.50	35.25
GK Soft Clay	ton	11.00	
Hi-White R	ton	13.50	
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
Paragon	ton	13.50	31.50
McNamee	ton	13.50	
RX-43	ton	33.00	
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	14.00	32.00
Swanee	ton	12.50	
Windsor	ton	14.00	30.00
Diatomaceous silica	ton	32.00	48.00
Flocks			
Cotton, dark	lb.	.095	.135
Dyed	lb.	.55	.60
White	lb.	.13	.33

Fabrifil X-24-G	lb.	$0.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.36 /	$3.50
Kalite	ton	50.00 /	65.00
Lithopone, comml.	lb.	.075 /	.085
Albalith	lb.	.075 /	.085
Astrolith	lb.	.06¾/	.0675
Eagle	lb.	.0725/	.075
Sunolith	lb.	.075 /	.0825
Mica Concord	lb.	.075 /	.0825
Millical	ton	35.00 /	50.00
Mineralite	ton	40.00 /	60.00
Non-Fer-Al	ton	30.00 /	45.00
Purecal	ton	56.75 /	71.75
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Sawdust	ton	14.00 /	35.00
Stan-White	ton	8.50 /	9.45
Super-White Silica	ton	23.00 /	43.00
Suspenso	ton	33.00 /	48.00
Ti-Cal	lb.	.0675	
Valron estersil	lb.	1.00	
Whiting, limestone			
Atomite	ton	30.00	
Calcite	ton	21.50	
Keystone	ton	16.00	
Laminar	ton	30.00	
Omya	ton	30.00	
Paxinosa	ton	10.00 /	18.00
Snowflake	ton	17.00 /	18.00
Stonelite	ton	9.00	
Witco	ton	8.50	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50 /	8.00
Flocks, Rayon, colored	lb.	.90 /	1.50
White	lb.	.75 /	1.25
Also see Flocks, under Fillers, Inert			
Rubber lacquer, clear	gal.	1.00 /	2.00
Shellacs, Angelo	lb.	.485 /	.7325
Vac Dry	lb.	.485 /	.57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15 /	.20
Wax, Bees	lb.	.64 /	.76
Carnauba	lb.	.56 /	1.03
Montan	lb.	.30 /	.32
No. 118, colors	gal.	.86 /	1.41
Neutral	gal.	.76 /	1.31
Van Wax	gal.	1.45 /	1.50

Latex Compounding Ingredients

Acintol D, DLR	lb.	.06 /	.075
FA #1	lb.	.065 /	.08
#2	lb.	.075 /	.09
Accelerator 552	lb.	2.25	
J-117, -302	lb.	1.00 /	1.15
-144	lb.	.15 /	.30
-307	lb.	1.10 /	1.25
-311	lb.	.60 /	.75
Aerosol, dry types	lb.	.39 /	1.20
Liquid types	lb.	.40 /	.72
Alcogum AN-6	lb.	.05	
AN-10	lb.	.085	
Alrosol	lb.	.41	
Alrowet D-75	lb.	.63	
Amberex solutions	lb.	.1675/	.18
Antifoam J-114	lb.	3.25 /	3.45
P-242	lb.	.24 /	.35
Antioxidant J-137, -140	lb.	.55 /	.70
-139, -293	lb.	1.45 /	1.60
-182	lb.	2.00 /	2.15
-186	lb.	1.40 /	1.55
2246	lb.	1.50 /	1.53
Anti Webbing Agent J-183	lb.	.75 /	.90
-297	lb.	.27 /	.40
Aquablak B	lb.	.0925/	.0975
G	lb.	.105 /	.11
K	lb.	.1075/	.1125
M	lb.	.085 /	.09
Aquarex D	lb.	.78	
G	lb.	.21	
L. ME	lb.	.94	
MDL	lb.	.33	
NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.23	
Areskap 50	lb.	.30 /	.38
100, dry	lb.	.60 /	.72
Aresket 240	lb.	.30 /	.38
300, dry	lb.	.60 /	.72
Aresklene 375	lb.	.42 /	.57
Ben-A-Gels	lb.	.98 /	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -300	lb.	1.36 /	1.60
CW-12	lb.	.85	
37	lb.	.70	
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
Dispersing Agents			
Blancol	lb.	.1525/	.26
N	lb.	.155 /	.26
Darvan Nos. 1, 2, 3	lb.	.22 /	.30
Daxad 11, 21, 23, 27	lb.	.08 /	.30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Empulphor ON-870	lb.	.50 /	.70
Igepal CO-630	lb.	.2875/	.47
Igepon T-73	lb.	.285 /	.495
T-77	lb.	.45 /	.69
Indulins	lb.	.06 /	.08
Kreelons	lb.	.132 /	.155
Laurelton Oil	lb.	.18	

Leonil SA	lb.	$0.52 /	$0.65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225/	.1425
N	lb.	.095 /	.105
Modicols	lb.	.17 /	.58
Nekal BA-75	lb.	.395 /	.54
BX-76	lb.	.63 /	.75
Pluronics	lb.	.335 /	.40
Polyfons	lb.	.08 /	.09
Sorapon SF-78	lb.	.28 /	.40
Tergitol NPX	lb.	.275 /	.3074
TMN	lb.	.2875/	.32
7	lb.	.4125/	.44
Trenamine	lb.	.15	
Triton R-100	lb.	.12 /	.25
X-100, -102, -114	lb.	.255 /	.36
Dispersions			
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Black No. 25	lb.	.22	
Shield Nos. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron Oxide, 60%	lb.	.40	
L.S.W.	lb.	1.50	
No. 305 Liquizinc	lb.	.30 /	.35
P-33	lb.	.35	
Rayox	lb.	.45	
Rotax	lb.	.75	
Sulfur	lb.	.12 /	.30
No. 2	lb.	.14 /	.16
Telloy	lb.	3.00	
Tuads, Methyl	lb.	1.60	
Vulcanizing, C group	lb.	.40 /	1.30
G group	lb.	.45 /	.90
N group	lb.	.40 /	1.00
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.30	
Ethyl, Methyl	lb.	1.35	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Stalite	lb.	.75	
Habuco Resin Nos. 502, 515, 523	lb.	.195 /	.20
503	lb.	.22 /	.225
504, 526	lb.	.19 /	.195
517	lb.	.175 /	.18
524	lb.	.155 /	.16
Resin A-2	lb.	.16 /	.25
P-370	lb.	.175 /	.25
X-210	lb.	.12 /	.22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Gelling Agent P-397	lb.	.34 /	
Igepon T-43	lb.	.145 /	.35
T-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
Indulins	lb.	.06 /	.08
Ludox	lb.	.1675/	.195
Marmix	lb.	.41 /	.48
Merac	lb.	.75 /	1.05
Micronex, colloidal	lb.	.06 /	.072
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD-101	lb.	.16 /	.26
Pliolite Latex 150, 190	lb.	.32 /	.41
170	lb.	.37 /	.46
Polyvinyl methyl ether	lb.	.25 /	.45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse D	lb.	.44 /	.65
S	lb.	.13 /	.25
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905 /	.975
30A	lb.	.245 /	.265
ST	lb.	.585 /	.615
Setsit #5	lb.	.75 /	1.05
Stablex A	lb.	.80 /	1.10
B, G	lb.	.50 /	.95
K	lb.	.27 /	.35
P	lb.	.35 /	.50
T	lb.	.14 /	.22
Surfactol 13	lb.	.345 /	.36
Webnix	lb.	1.50 /	2.50

Mold Lubricants

Acintol D	lb.	.06 /	.075
A-C Polyethylene	lb.	.30 /	.37
Akro Gel	lb.	.165	
Alipal CO-433	lb.	.25 /	.45
CO-436	lb.	.22 /	.41
Aquarex Compounds	lb.	.21 /	.94
Carbowax 200, 300, 400	lb.	.22 /	.25
1500	lb.	.255 /	.2825
4000	lb.	.31 /	.32
6000	lb.	.35 /	.36
Castorwax	lb.	.21 /	.27
Colite Concentrate	gal.	.90 /	1.15
D-Tak Dip #10	gal.	1.50	
ELA	lb.	.82	
DC Mold Release Fluid	lb.	3.39 /	4.75
Emulsion Nos. 35, 35A, 35B, 36	lb.	1.36 /	2.50
DC7	lb.	5.13 /	6.50
8	lb.	1.36 /	1.80
Glycerized Liquid Lubricant, concentrated	gal.	1.48 /	1.63
Igepals	lb.	.2875/	.74
Igepon AP-78	lb.	.44 /	.68
T-43	lb.	.145 /	.35
T-51	lb.	.125 /	.285
T-73	lb.	.285 /	.495
Lubrex	lb.	.25 /	.30

Lubri-Flo	gal.	$10.00 /	$12.05
Lustermold	lb.	.41	
Mold Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
Para Lube	lb.	.046 /	.048
Pluronics	lb.	.335 /	.44
Polyglycol E series	lb.	.29 /	.42
Rubber-Glo	gal.	.94 /	.97
Soap, Hawkeye	lb.	1.35 /	1.45
Purity	lb.	.155 /	.165
Sodium stearate	lb.	.40	
Stoner's 700 series	gal.	1.20 /	1.25
800 series	gal.	1.26 /	1.70
900 series	gal.	1.55 /	2.55
A Series	gal.	1.80 /	4.50
Ucon 50-HB Series	lb.	.25 /	.375
Ulco	lb.	.12 /	.23
Vanfre	gal.	2.50 /	3.00

Odorants

Alamasks	lb.	.75 /	6.50
Coumarin	lb.	2.95 /	3.55
Curodex 19	lb.	4.75 /	5.05
188	lb.	5.75	
198	lb.	6.75	
Ethavan	lb.	6.75 /	7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00 /	3.15

Plasticizers and Softeners

Acintol R	lb.	.065 /	.07
Adipol 2EH, 10A	lb.	.425 /	.455
BCA	lb.	.45 /	.475
ODY	lb.	.47 /	.50
Admex 710	lb.	.325	
711	lb.	.345	
744	lb.	.40	
Aro Lene #1980	lb.	.10 /	.12
Baker AA Oil	lb.	.195 /	.24
Crystal O Oil	lb.	.21 /	.255
Processed oils	lb.	.215 /	.235
Bardol, 639	lb.	.215 /	.235
B	lb.	.0625/	.065
Benzoflex 2-45	lb.	.26 /	.29
9-88	lb.	.27 /	.30
Bondogen	lb.	.55 /	.60
BRC 20	lb.	.15 /	.175
22	lb.	.025 /	.0275
30	lb.	.0125/	.021
521	lb.	.019 /	.02
BRH 2	lb.	.0213/	.0351
BRS 700	lb.	.02 /	.0285
BRT 7	lb.	.03 /	.031
BRV	lb.	.0475/	.0565
Bunarex Liquid	lb.	.0425/	.0555
Resins	lb.	.065 /	.1225
Bunnatol G, S	lb.	.40 /	.505
Butac	lb.	.125 /	.135
Butyl stearate, comml.	lb.	.24 /	.27
Binney & Smith	lb.	.23 /	.26
Hardesty	lb.	.23 /	.26
Ohio-Apex	lb.	.22 /	.25
BxDC	lb.	.40 /	.41
Cabflex HS-10	lb.	.44 /	.47
Califlux 510, 550	lb.	.025 /	.0325
G. P.	lb.	.0125/	.02
R-100	lb.	.045 /	.0525
T T	lb.	.017 /	.0245
Capryl alcohol, comml.	lb.	.195 /	.235
Binney & Smith	lb.	.18 /	.28
Hardesty	lb.	.18 /	.28
Chlorowax 40	lb.	.1625/	.1825
70	lb.	.185 /	.245
-S	lb.	.21 /	.27
Contogums	lb.	.0875/	.111
Cumar Resins	lb.	.065 /	.17
DBM (dibutyl-m-cresol)			
Darex	lb.	.32 /	.3475
DBP (dibutyl phthalate), comml.	lb.	.30 /	.33
Darex	lb.	.30 /	.33
Hatco	lb.	.30 /	.33
Monsanto	lb.	.30 /	.33
Naugatuck	lb.	.30 /	.33
Ohio-Apex	lb.	.30 /	.33
PX-104	lb.	.30 /	.33
Rubber Corp. of America	lb.	.30 /	.44
Sherwin-Williams	lb.	.30 /	.33
DBS (dibutylsebacate), comml.	lb.	.66 /	.69
Hatco	lb.	.66 /	.685
Monoplex	lb.	.66 /	.675
Naugatuck	lb.	.665 /	.69
PX-404	lb.	.665 /	.69
DCP (dicaprylphthalate), comml.	lb.	.295 /	.325
Hatco	lb.	.295 /	.325
Monoplex	lb.	.30 /	.315
DDA (didecyladipate)			
Cabflex	lb.	.425 /	.455
Good-rite GP-236	lb.	.425 /	.57
DDP (didecylphthalate)			
Cabflex	lb.	.305 /	.335
Good-rite GP-266	lb.	.305 /	.455
Hatco	lb.	.305 /	.435
Defoamer X-3	lb.	.355	
DIBA (diisobutyladipate)			
Cabflex	lb.	.4325/	.4625
Darex	lb.	.4325/	.4625
Ohio-Apex	lb.	.4325/	.4625
DIDA (diisodecyladipate)			
Monsanto	lb.	.425 /	.455
DIDP (diisodecylphthalate)			
Darex	lb.	.32 /	.35
Monsanto	lb.	.305 /	.335
Ohio-Apex	lb.	.305 /	.335
PX-120	lb.	.305 /	.335

Dielex B	lb.	$0.06	
Diethylene glycol, comml.	lb.	.1525 /	$0.1825
Wyandotte	lb.	.15 /	.165
Dinopol IDO	lb.	.305 /	.335
DIOA (diisooctyladipate)			
Cabflex	lb.	.425 /	.455
Naugatuck	lb.	.435 /	.465
PX-208	lb.	.425 /	.455
Rubber Corp. of America	lb.	.425 /	.56
DIOP (diisooctylphthalate), comml.	lb.	.305 /	.335
Cabflex	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Hatco	lb.	.305 /	.335
Monsanto	lb.	.305 /	.335
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.305 /	.335
PX-108	lb.	.305 /	.335
Rubber Corp. of America	lb.	.305 /	.45
Sherwin-Williams	lb.	.32 /	.34
DIOS (diisooctylsebacate), comml.	lb.	.61 /	.64
Rubber Corp. of America	lb.	.61 /	.84
DIOZ (diisooctylazelate)			
Cabflex	lb.	.48 /	.5075
Dipolymer Oil	gal.	.33 /	.38
Dispersing Oil No. 10	lb.	.06 /	.0625
DNODP (di-n-octyl-n-decyl phthalate), Monsanto	lb.	.345 /	.375
DOA (dioctyladipate), comml.	lb.	.425 /	.455
Cabflex	lb.	.425 /	.455
Good-rite GP-233	lb.	.425 /	.57
Hatco	lb.	.435 /	.465
Monsanto	lb.	.425 /	.455
Naugatuck	lb.	.435 /	.465
PX-238	lb.	.425 /	.455
Rubber Corp. of America	lb.	.425 /	.56
DOP (dioctylphthalate), comml.	lb.	.305 /	.335
Cabflex	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Good-rite GP-261	lb.	.305 /	.455
Hatco	lb.	.305 /	.335
Monsanto	lb.	.305 /	.335
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.305 /	.335
PX-138	lb.	.305 /	.335
Rubber Corp. of America	lb.	.305 /	.45
Sherwin-Williams	lb.	.32 /	.34
DOS (dioctylsebacate), comml.	lb.	.61 /	.64
Hatco	lb.	.61 /	.635
Monoplex	lb.	.61 /	.635
Naugatuck	lb.	.615 /	.64
PX-438	lb.	.615 /	.64
Rubber Corp. of America	lb.	.61 /	.84
Drapex 3.2	lb.	.40 /	.45
Dutch Boy NL-A10 (DBP)	lb.	.30 /	.33
-A20 (DOP), A30 (DIOP)	lb.	.305 /	.335
-A54	lb.	.295 /	.325
-C20 (DOS)	lb.	.61 /	.63
-F21	lb.	.395 /	.425
-F31	lb.	.44 /	.47
-F41	lb.	.48 /	.51
Dutrex 6	lb.	.025 /	.035
Emulphor EL-719	lb.	.52 /	.73
Ethox	lb.	.43 /	.455
Ethylene glycol, comml.	lb.	.135 /	.165
Wyandotte	lb.	.1325 /	.1425
Flexol 3 GH	lb.	.44 /	.46
3 GO	lb.	.53 /	.55
4 GO	lb.	.325 /	.355
10-A	lb.	.425 /	.455
426	lb.	.27 /	.30
810, 810X, 10-10, 10-10X	lb.	.305 /	.335
TOF, A-26	lb.	.435 /	.465
Flexricin P-1	lb.	.295 /	.31
P-4	lb.	.285 /	.30
P-8	lb.	.305 /	.32
PG-16	lb.	.335 /	.35
Fortex	lb.	.125 /	.145
G. B. Asphaltic Flux	gal.	.08 /	.14
Naphthenic Neutrals	gal.	.11 /	.18
Process oil, light	lb.	.025 /	.0325
Medium	lb.	.035 /	.0425
Galex W-100	lb.	.155 /	.18
W-100 D	lb.	.1525 /	.1775
Gilsowax B	lb.	.0975 /	.11
Harchemex	lb.	.25 /	.34
Harflex 10	lb.	1.25 /	1.335
40	lb.	.66 /	.745
50, 80	lb.	.61 /	.695
60	lb.	.62 /	.705
90	lb.	.88 /	.965
120, 150	lb.	.32 /	.35
140, 160, 180	lb.	.30 /	.33
220	lb.	.435 /	.465
260	lb.	.42 /	.45
280	lb.	.43 /	.46
500	lb.	.315 /	.345
HB-20	lb.	.15 /	.17
-40	lb.	.19 /	.21
Heavy Resin Oil	lb.	.0225 /	.0375
HSC-13	lb.	.27 /	.30
Indoil Compound 51-S	lb.	1.00 /	1.10
Indonex	gal.	.11 /	.19
Kapsol	lb.	.3225 /	.3525
Kenflex A, L	lb.	.26 /	.27
B	lb.	.23 /	.24
N	lb.	.18 /	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.29 /	.32
-90	lb.	.40 /	.43

-140	lb.	$0.46 /	$0.485
KP-201	lb.	.5825 /	.5925
-220	lb.	.31 /	.34
-555	lb.	.45 /	.475
Kronisol	lb.	.33 /	.355
Kronitex AA, I	lb.	.33 /	.36
Marvinol plasticizers	lb.	.28 /	.8825
Methox	lb.	.385 /	.41
Monoplex S-38	lb.	.215 /	.24
S-71	lb.	.45 /	.475
Morflex	lb.	.25 /	.65
Neoprene Peptizer P.-12	lb.	1.05	
Nevillac	lb.	.39 /	.85
Neville R Resins	lb.	.15 /	.35
Nevinol	lb.	.20	
No. 1-D heavy oil	lb.	.065	
ODA (octyldecyladipate)			
Cabflex	lb.	.425 /	.455
Good-rite GP-235	lb.	.425 /	.57
ODP (octyldecylphthalate)			
Cabflex	lb.	.305 /	.335
Good-rite GP-265	lb.	.305 /	.455
Hatco	lb.	.305 /	.335
Rubber Corp. of America	lb.	.305 /	.45
Ohopex R-9	lb.	.3525 /	.3775
Q-10	lb.	.295 /	.325
Orthonitro benzophenol, comml.	lb.	.13 /	.15
Monsanto	lb.	.13 /	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185 /	.225
Para Flux, regular	gal.	.10 /	.2125
No. 2016	gal.	.165 /	.24
2332	gal.	.11	
4205	lb.	.1075 /	.2125
Para Lube	lb.	.046 /	.048
Resins	lb.	.04 /	.045
Paradene Resins	lb.	.065 /	.075
Paraplex 5-B	lb.	.29 /	.3475
AL-111	lb.	.32 /	.3275
G-25	lb.	.76 /	.77
-40	lb.	.51 /	.52
-50	lb.	.4025 /	.4275
-53	lb.	.45 /	.475
-60	lb.	.325 /	.35
-62	lb.	.345 /	.37
RG-7	lb.	.33 /	.335
-8	lb.	.505 /	.5125
-10	lb.	.52 /	.5275
Pepton 22	lb.	.79 /	.82
Philrich 5	gal.	.11	
Picco Resins	lb.	.135 /	.195
480 Oilproof Series	lb.	.18 /	.23
Aromatic Plasticizers	lb.	.05 /	.065
Liquid Resin D-165 (Y)	lb.	.06 /	.075
(Z-3)	lb.	.07 /	.085
(Z-6)	lb.	.08 /	.095
S. O. S.	gal.	.29 /	.34
Piccocizers	lb.	.04 /	.055
Piccolastic Resins	lb.	.1855 /	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.12 /	.135
Piccovars	lb.	.165 /	.20
Piccovol	lb.	.025 /	.038
Pictar	gal.	.25 /	.30
Pigmentar	lb.	.046 /	.0745
Pigmentaroil	lb.	.046 /	.0745
Pine Tar, Sunny South	lb.	.046 /	.0801
Oil, Sunny South	lb.	.046 /	.0801
Pitch, Burgundy, Sunny South	lb.	.1030 /	.1085
Plasticizers			
42	lb.	.34 /	.40
B	lb.	.35 /	.45
DP-520	lb.	.435 /	.455
MP	lb.	.035 /	.0755
MT-511	lb.	.535 /	.565
ODN	lb.	.32 /	.37
SC	lb.	.54 /	.63
Plastoflex #3	lb.	.52 /	.57
#520	lb.	.36 /	.435
DBE	lb.	.50 /	.55
MGB	lb.	.32 /	.40
SP-2	lb.	.43 /	.48
VS	lb.	.40 /	.475
Plastogen	lb.	.0775 /	.08
Plastone	lb.	.22 /	.3075
Polycin 470	lb.	.275 /	.29
Polycizers	lb.	.40 /	.47
Polymel D	lb.	.225 /	.235
DX, C-130	lb.	.1375 /	.1475
C-128	lb.	.1775 /	.1875
D-TAC	lb.	.1975 /	.215
PT67 Light Pine Oil	gal.	.60	
101 Pine Tar Oil	lb.	.0427 /	.0601
Pine Tars	lb.	.0427 /	.0601
R-19, R-21 Resins	lb.	.1075	
Reogen	lb.	.1325 /	.135
Resin C pitch	lb.	.0225 /	.031
R6-3	lb.	.38 /	.40
Resinex 10, 25, 50, 110	lb.	.04 /	.045
70	lb.	.0325 /	.0375
85, 100	lb.	.035 /	.04
115	lb.	.0375 /	.0425
L-2, L-3, L-4, L-5	lb.	.0225 /	.03
Rosin Oil, Sunny South	gal.	.58 /	.875
RPA No. 2	lb.	.78	
3	lb.	.47	
Conc.	lb.	.97	
5	lb.	.59	
RSN Flux	gal.	.10 /	.19
Rubber Oil B-5	lb.	.0225 /	.0355
Rubberol	lb.	.2575 /	.2725
Santicizer 1-H	lb.	.50 /	.51
3	lb.	.46 /	.47
8	lb.	.43 /	.44
9	lb.	.39 /	.42
140	lb.	.33 /	.36

Santicizer-141	lb.	$0.34 /	$0.37
160	lb.	.25 /	.28
601	lb.	.325	
602	lb.	.305	
B-16	lb.	.4875 /	.4975
E-15	lb.	.5075 /	.5375
M-17	lb.	.4275 /	.4575
Sebacic acid, purified, comml.	lb.	.59 /	.65
Binney & Smith	lb.	.64 /	.76
Hardesty	lb.	.64 /	.76
C.P.-Binney & Smith	lb.	.72 /	.84
Hardesty	lb.	.72 /	.84
Sherolatum Petrolatum	lb.	.05 /	.10
Softener #20	gal.	.10 /	.20
Special Rubber Resin 100	lb.	.1675 /	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61 /	.635
Syn-Tac	gal.	.33 /	.35
Synthol	lb.	.2475	
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Tricresyl phosphate, comml.	lb.	.33 /	.36
Cabflex	lb.	.33 /	.36
Monsanto	lb.	.33 /	.36
Naugatuck	lb.	.33 /	.36
PX-917	lb.	.33 /	.36
Triphenyl phosphate, comml.	lb.	.39 /	.40
Monsanto	lb.	.39 /	.40
Turgum S	lb.	.1075 /	.1175
Tysonite	lb.	.24 /	.2475
United	gal.	.69 /	1.20
X-1 Resinous Oil	lb.	021 /	.0275

Reclaiming Oils

Acintol C, P	lb.	.02 /	.03
Bardol, 639	lb.	.0275 /	.0375
B	lb.	.0625 /	.065
BRH 2	lb.	.0213 /	.0351
BRT 3	lb.	.018 /	.0265
4	lb.	.025 /	.026
7	lb.	.03 /	.031
BRV	lb.	.0475 /	.0565
Burco-RA	lb.	.053 /	.0805
BWH-1	lb.	.16 /	.18
Dipolymer Oil	gal.	.33 /	.43
Dispersing Oil No. 10	lb.	.06 /	.0625
G. B. Oils	gal.	.10 /	.24
Heavy Resin Oil	lb.	.0225 /	.0375
LX-777	gal.	.23 /	.33
No. 3186	gal.	.28 /	.295
Picco 6535	gal.	.25 /	.30
C-33	gal.	.215 /	.315
-42	gal.	.23 /	.33
D-4	gal.	.27 /	.37
E-5	gal.	.25 /	.35
Q-Oil	gal.	.286 /	.36
PT 67	gal.	.60	
101 Pine Tar Oil	lb.	.0427 /	.0610
150 Pine Solvent	gal.	.44	
Reclaiming Oil #3186	gal.	.28 /	.385
-G	gal.	.25 /	.365
4039-M	gal.	.3275 /	.3975
-Y	gal.	.30 /	.37
RR-10	lb.	.36	
S. R. O.	lb.	.015 /	.0225
X-1 Resinous Oil	lb.	.021 /	.03

Reinforcers, Other Than Carbon Black

American Resinous Chemical			
978-42B	lb.	.18 /	.19
1073-18B	lb.	.135 /	.145
1294-36B	lb.	.115 /	.125
1301-12B	lb.	.15 /	.16
Angelo Shellacs	lb.	.485 /	.7325
BRC 20	lb.	.15 /	.175
22	lb.	.025 /	.0275
30	lb.	.0125 /	.021
521	lb.	.019 /	.02
Bunarex Resins	lb.	.065 /	.1225
Cab-o-sil	lb.	.68 /	.75
Calcene NC	ton	72.50 /	92.50
TM	ton	75.00 /	95.00
Calco S. A.	lb.	.85 /	.88
Clays			
Aiken	ton	14.00	
Buca	ton	45.00	
Burgess HC-75	ton	12.00 /	30.00
HC-80	ton	14.00 /	32.00
Iceberg	ton	50.00 /	60.00
Pigment No. 20	ton	35.00 /	60.00
30	ton	37.00 /	60.00
Catalpo	ton	35.00	
Crown	ton	14.00 /	33.00
Dixie	ton	14.00	
Franklin	ton	13.50 /	35.25
L. G. B.	ton	17.00	
Paragon	ton	13.50 /	33.00
Pigment No. 33	ton	37.00	
Recco	ton	14.00	
Suprex	ton	14.00 /	33.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00 /	30.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175 /	.1255
Cumar Resins	lb.	.065 /	.17
Darex Resins	lb.	.42 /	.49
Diatomaceous silica	ton	32.00 /	48.00
Good-rite Resin 50	lb.	.39 /	.41
K Series Polymers	lb.	.15 /	.37
Hi-Sil 101	lb.	.10 /	.115
233	lb.	.09 /	.105
X303	lb.	.40 /	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	

Indulins	lb.	$0.06 /	$0.08
Kralac A-EP	lb.	.43 /	.54
Laminar	ton	30.00	
Magnesium carbonate,			
Merck	lb.	.105 /	.12
Marbon Resins	lb.	.39 /	.46
Multifex	ton	140.00 /	155.00
MM	ton	110.00 /	125.00
Super	ton	160.00 /	175.00
Neville Resins			
465	lb.	.07 /	.0825
G	lb.	.13	
LX-509	lb.	.35	
Nebony	lb.	.04 /	.0575
Paradene	lb.	.065 /	.075
R	lb.	.13 /	.18
Para Resins 2457, 2718	lb.	.04 /	.45
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.13 /	.185
Piccolyte Resins	lb.	.205 /	.275
Piccoumaron Resins	lb.	.07 /	.19
Piccovars	lb.	.145 /	.20
Pliolite NR types	lb.	.98 /	1.33
S-3, -6	lb.	.42 /	.49
-6B	lb.	.39 /	.46
Purecal M	ton	56.75 /	71.75
SC, T	ton	110.00 /	125.00
U	ton	120.00 /	135.00
R-B-H 510	lb.	.15 /	.22
Resinex	lb.	.0325 /	.0425
Rubber Resin LM-4	lb.	.28 /	.35
Silene EF	ton	120.00 /	140.00
Silvacons	ton	55.00 /	85.00
Witcarb R	ton	105.00 /	120.00
-12	ton	45.00 /	66.00
Zeolex 23	ton	120.00 /	140.00
Zinc oxide, commercial†	lb.	.135 /	.1775

Retarders

Benzoic acid TBAO-2	lb.	.44	
E-S-E-N	lb.	.35 /	.37
Good-rite Vultrol	lb.	.62 /	.66
R-17 Resin	lb.	.1075 /	.36
Retarder ASA	lb.	.57	
J	lb.	.62 /	.64
PD	lb.	.35 /	.37
W	lb.	.45	
Retardex	lb.	.47 /	.50
Thionex	lb.	1.14	

Solvents

Bondogen	lb.	.55 /	.60
Butyrolactone	lb.	.60 /	.65
Cosol #1	gal.	$0.37 /	$0.43
#2	gal.	.42 /	.48
Dichloro Pentanes	lb.	.04 /	.07
Dipentene DD,			
Sunny South	gal.	.40 /	.62
Ethylene dichloride, comml.	lb.	.09 /	.1225
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27 /	.32
-748	gal.	.16 /	.23
n-Methyl-2-pyrrolidone	lb.	.75 /	.80
Neville Nos. 100, 104	gal.	.52 /	.60
106	gal.	.38 /	.46
Nevsol B	gal.	.20 /	.30
H, 200	gal.	.19 /	.29
HF, T, 30	gal.	.24 /	.34
Penetrell	gal.	.40 /	.62
Picco Hi-Solv Solvents	gal.	.16 /	.48
Pine Oil DD,			
Sunny South	lb.	.1225 /	.1425
PT 150 Pine Solvent	gal.	.44	
Skellysolve-E	gal.	.153	
-H	gal.	.133	
-R, -V	gal.	.109	
-S	gal.	.099	
Stauffer Carbon Disulphide	lb.	.0525 /	.085
Tetrachloride	lb.	.0825 /	.475

Synthetic Rubber Monomers

Dow Styrene N99, H99	lb.	.205	
RG	lb.	.17	
Vinyltoluene	lb.	.17	
Monomer MG-1	lb.	1.00 /	1.25
Rohm & Haas ethyl acrylate	lb.	.34	
Methyl acrylate	lb.	.37	
Methyl methacrylate	lb.	.32 /	.34

Synthetic Rubber Shortstops

DDM	lb.	.85 /	.88
Thiostop K	lb.	.53	
N	lb.	.41	

Tackifiers

American Resinous Chemical			
A25, A26, 716-30	lb.	.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
Acintol R	lb.	$0.065 /	$0.07
Bardol, 639	lb.	.0275 /	.0375
BRH 2	lb.	.0213 /	.0351
Bunarex Resins	lb.	.065 /	.1225
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875 /	.11
Cumar Resins	lb.	.065 /	.17
Galex W-100	lb.	.155 /	.17
W-100D	lb.	.1525 /	.1625
Indopol H-35	gal.	.65 /	.81
H-50	gal.	.70 /	.86
-100	gal.	.85 /	1.05
-300	gal.	1.00 /	1.21
L-10	gal.	.40 /	.56
-50	gal.	.45 /	.61
-100	gal.	.55 /	.71
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.12 /	.13
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.13 /	.185
Piccolastic Resins	lb.	.1855 /	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.089 /	.13
Piccoumaron Resins	lb.	.07 /	.185
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.2475 /	.2625
United	gal.	.69 /	1.20

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Ko-Blend I, S	lb.	.39	
Litherage (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525 /	.38
Merck, Light Calcined	lb.	.2525 /	.26
Extra Light Calcined	lb.	.2925 /	.30
Red lead (*See Accelerator-Activators, Inorganic*)			
Sufsal R	lb.	1.50	
Sulfur flour, comml	100 lbs.	2.30 /	3.05
Aero	100 lbs.	2.15 /	7.50
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.40 /	4.30
Stauffer	lb.	.024 /	.0515
Telloy	lb.	2.50	
VA-7	lb.	.50 /	.60
Vandex	lb.	6.00	
Vultac No. 2	lb.	.47 /	.755
3	lb.	.51 /	.795
White lead silicate (*See Accelerator-Activators, Inorganic*)			

CALENDAR of COMING EVENTS

January 17

Elastomer & Plastics Group, Northeastern Section, ACS. "Specialty Latex Applications."

January 23-26

Seventh Annual Plant Maintenance & Engineering Show. Philadelphia, Pa.

January 26-27

Second Annual General Assembly of Engineers Joint Council. Hotel Statler, New York, N. Y.

January 27

Akron Rubber Group. Mayflower Hotel, Akron, O. Symposium on rubber in Modern Transportation.

February 3

Division of High-Polymer Physics, American Physical Society. Joint Symposium with Society of Rheology. Twenty-Fifth Anniversary Celebration of American Institute of Physics. New York, N. Y.

Detroit Rubber & Plastics Group. Detroit Leland Hotel, Detroit, Mich.

February 7

The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

February 9

Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

February 17

Chicago Rubber Group. Furniture Club, Chicago, Ill.

February 21

Elastomer & Plastics Group, Northeastern Section, ACS.

March 6

The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

March 15

Elastomer & Plastics Group, Northeastern Section, ACS. Symposium on Structure of Rubbers.

March 15-16

American Institute of Industrial Engineers, Inc. Cleveland Chapter. Fifth Annual Spring Conference.

March 15-17

Division of High-Polymer Physics, American Physical Society. Annual Meeting, Pittsburgh, Pa.

March 16

Chicago Rubber Group. Furniture Club, Chicago, Ill.

March 18-21

American Society of Mechanical Engineers. Spring Meeting. Multnomah Hotel, Portland, Oreg.

April 3

The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

April 3-9

International Symposium on Macromolecular Chemistry. The Weizmann Institute of Science, Rehovot, Israel.

April 6

Akron Rubber Group. Hotel Mayflower, Akron, O.

April 12

Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

April 17

Elastomer & Plastics Group, Northeastern Section, ACS.

April 27

Chicago Rubber Group. Furniture Club, Chicago, Ill.

May 1

The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

May 15

Elastomer & Plastics Group, Northeastern Section, ACS. Fifth Annual Short Talks Symposium.

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Allow nine words for keyed address.		

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Degree in chemistry or chemical engineering. Up to five years' experience in rubber and polymer processing, development or production. Progressive company, well-equipped laboratory; permanent position with opportunity for advancement in expanding operation. Write giving age, experience, and education. Replies held confidential. Address Box 369, Erie, Pennsylvania.

WANTED

MANUFACTURER'S AGENT for line of Neoprene and Hypalon protective coatings. Eastern seaboard and midwestern states. Address Box 1844, care of RUBBER WORLD.

MAINTENANCE ENGINEER FOR PLASTIC CALENDERS, mills, Banbury. Must be experienced. Address Box No. 1845, care of RUBBER WORLD.

CHIEF LATEX CHEMIST TO DIRECT SOUTHERN MANUfacturing division of latex compounds for textile industry. Must be tops on compound experience and development. Excellent opportunity in established growing concern. State fully qualifications and requirements. Address Box No. 1846, care of RUBBER WORLD.

WANTED: ADHESIVE-TAPE CALENDER OPERATOR AND compounder to take responsibility for new department in growing diversified company in the South. Give complete biography and references. All replies confidential. Address Box No. 1847, care of RUBBER WORLD.

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Northeastern Ohio manufacturer of O-Rings, Seals, Diaphragms, etc., wants experienced chemist to work directly with plant manager. Excellent opportunity for right man. All replies confidential. Address Box No. 1848, care of RUBBER WORLD.

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Graduate chemist or chemical engineer required with formulation and practical industrial experience on flexible and rigid vinyl extrusions as well as general plastic know-how. Replies held confidential. Excellent opportunity. Address Box No. 1849, care of RUBBER WORLD.

PLASTISOL, LATEX CHEMISTS. TECHNICAL SALES AND development—experience in thread, cap and can sealing desirable. Full charge, and assistants. Address Box No. 1850, care of RUBBER WORLD.

WANTED: 2 CHEMICAL ENGINEERS FOR NEW POSITIONS IN expanding small company. Prefer 3-5 years' experience. Send résumé and salary requirements to Personnel Manager, St. Clair Rubber Company, Marysville, Michigan.

PLANT MANAGER—MECHANICAL RUBBER GOODS—MOLDED and lathe cut—well-known independent company employing 275 people—must be aggressive cost cutter—excellent working conditions. Write giving complete résumé and state salary requirements. Address Box No. 1851, care of RUBBER WORLD.

EXPANDING LATEX COMPOUND COMPANY LOCATED IN THE East has opening for a young man in technical sales. Company well established. Knowledge of Latex important. Position has excellent future for the right man. Salary not main consideration. Send complete résumé giving education and experience in first letter. Replies strictly confidential. Address Box No. 1856, care of RUBBER WORLD.

SITUATIONS OPEN (Continued)

HOSE DEVELOPMENT ENGINEER

Rocky Mountain area has excellent opportunity for 25- to 40-year-old graduate engineer. Minimum of 3 years' experience in industrial hose design. Wire-braided hose experience desirable. GATES RUBBER COMPANY, 999 South Broadway, Denver 17, Colorado.

NEW IDEAS—NEW TOOLS—NEW BLOOD NEEDED BY AUTO INDUSTRY

Well-established, active Detroit agency seeks to represent midwestern rubber company. Personnel includes experienced rubber engineer. Write P. O. Box 5151, Detroit 35, Mich.

SOUTHERN CALIFORNIA

Well-established diversified mechanical rubber goods manufacturer in Southern California has opening for Chemists—Development Men—Cost Estimator. Excellent opportunity for qualified applicants. Address Box No. 1857, care of RUBBER WORLD.

SITUATIONS WANTED

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Factory Manager experienced in Molded Rubber Operating Procedures, Plant Development & Layout and Personnel Procedures seeks change in Employment. Address Box No. 1852, care of RUBBER WORLD.

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Twelve years' Rubber and Plastics, trouble shooting, installation, intimate technical knowledge of Internal Mixers, Mills, Calenders, Extruders, Presses, Tire Plant, Plastics Extrusion, Design of special Equipment. English, resident of Canada, present territory Canada and States, good connections Europe and North America, anywhere in World. Address Box No. 1853, care of RUBBER WORLD.

MACHINERY AND SUPPLIES FOR SALE

FOR SALE: DOUBLE-ARM SIGMA-BLADE JACKETED mixers; (4) Read 50-gal., 30 HP; (2) W & P 100-gal. Kux model 25 **rotary pellet presses, 21 and 25 punch. 14,000-gal. A. O. Smith Glass-Lined Tanks. WE BUY SURPLUS EQUIPMENT. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila., 22, Pa.**

FOR SALE: 1—6 X 12″ LAB MILL; 1—NATIONAL-ERIE 3¼″ extruder; 1—Farrel 6″ tuber; 3—rubber mills 30″, 42″, 48″ MD; also presses, vulcanizers, calenders, cutters, etc. CHEMICAL & PROCESS MACHINERY CORP., 52 Ninth Street, Brooklyn 15, N. Y.

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MACHINERY AND SUPPLIES FOR SALE (Continued)

FOR SALE: 15" X 30" MILL AND 16" X 40" MILL; ALSO 24" X 54" press with two 11" diameter rams. Address Box No. 1854, care of RUBBER WORLD.

FOR SALE: FARREL-BIRMINGHAM LABORATORY UNIT CONSISTING of 6 x 12" two-roll mill and 6 x 12" three-roll calender on one bedplate complete with motor in very good condition; one Scott Tester Model L-3; 12 x 12" electrically heated presses for laboratory and small production work; one Spadone Crude Rubber Bale Cutter; also production mills, calenders, extruders, and presses. ERIC BONWITT, 431 S. Dearborn St., Chicago 5, Ill.

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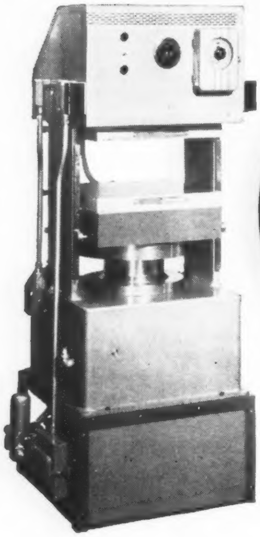

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FOR SALE: 3—#28 DEVINE VACUUM SHELF DRYERS, 19-59" X 78" shelves, complete; 2—Farrel-Birmingham 16" x 42" mills with reduction drive and 100-hp motor; 1—Read 2,000-lb. all-steel double-ribbon horizontal mixer; 1—Ball & Jewell rotary cutter, size 0, m.d.; 1—Stewart Bolling 4-roll 58" Calender; 1—8" x 16" 2-roll mill, m.d.; 3—Colton #5½ single punch tablet machines, m.d.; 1—6" x 12" laboratory mill, m.d.; also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. WANTED: Your Surplus Rubber Machinery. CONSOLIDATED PRODUCTS CO., INC., 64 Bloomfield St., Hoboken, N. J.; HOboken 3-4425; N. Y. Phone: BArclay 7-0600.

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WANTED: #9 OR #11 BANBURY. 3-ROLL CALENDER WITH 40" or larger rolls. 50"-60" mill. #2 or #3 Extruder. Address Box No. 1855, care of RUBBER WORLD.

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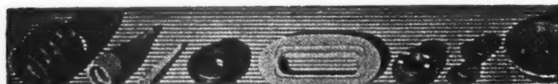

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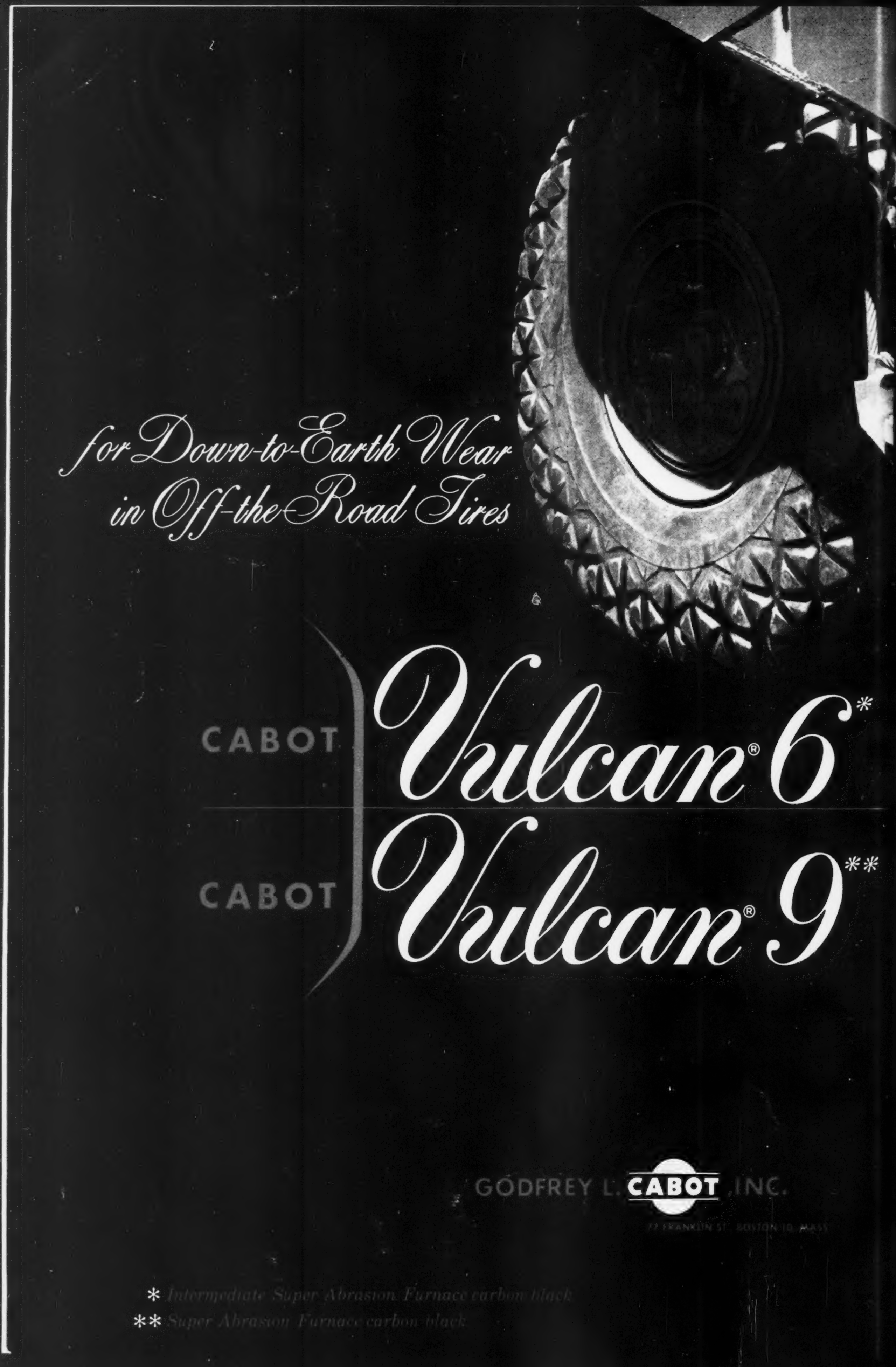
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